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VETERINARY MEDICINE

MARCH CONTENTS 1948

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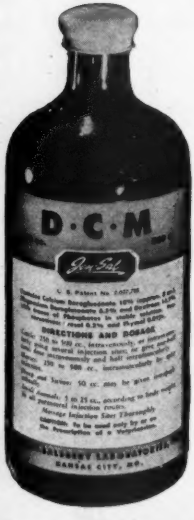

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D. M. CAMPBELL, *Editor*
7632 S. Crandon Ave., Chicago 49, Ill.
Telephone South Shore 7168

H. J. MOSTYN, *Eastern Representative*
P. O. Box 391, Dover, New Jersey
Telephone Dover 6-2711W.

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In 1940, 10 million Americans entered hospitals. In 1945, the number was 16 million.

Cattle carcasses retained for tuberculosis in the federally inspected meat packing plants numbered 220,000 in 1917; 17,000 in 1947.

In England 5.2% of all deaths in man from tuberculosis are due to the bovine tubercle bacillus. Milk samples from various cities show virulent tubercle bacilli in from 2.9 to 11.1%.—H. M. O'REAR.

The USDA estimates (Jan. 7, 1946) that "nearly 40,000 animals or 16 million pounds of beef a year, which would have otherwise been condemned as unfit for human consumption, are saved as a result of the bovine tuberculosis eradication campaign."

An extensive 13-year study of BCG vaccine in Chicago led to definite conclusions: (1) the vaccine is harmless and (2) that tuberculosis infection was reduced 75% and deaths due to tuberculosis were reduced 91% by use of the vaccine.

Tuberculosis in man, produced by the bovine type of tubercle bacillus, is an extremely serious problem wherever the disease has not been controlled among the cattle herds. Other domestic animals, such as dogs, sheep, swine and even parrots, develop tuberculosis from the bovine type of bacillus and may transmit it to man.—J. A. MYERS, M.D., University of Minnesota, Medical School.

A Spanish edition of "Anatomy of Domestic Animals," by Sisson and Grossman, has been published recently in Barcelona.

The Army Signal Corps announces the production of sound waves so high pitched as to be inaudible to human ears, yet fatal to insects, cockroaches and even mice.

Bushnell (Kansas Exp. Sta.) reports placing birds affected with avian pneumoencephalitis in cages with susceptible birds and experiencing no spread of the disease, *i.e.*, susceptible birds were not infected by contact in the experiment.

The half-starved heifer is difficult to breed and the chances are better than even, that her first calf will be her last. Everything in the book is prone to happen to her at parturition and post partum.

The vitamin requirements for turkeys are as a rule greater than for chickens. For example, twice as much vitamin A and four times as much vitamin D are needed for turkey poults as for baby chicks.

Ever since the world's first school of veterinary medicine was established at Lyons, France, in 1762, veterinarians have strived to control tuberculosis among cattle. They have always given two reasons for the necessity of control: first the disease is contagious to man and, second, it constitutes a serious economic problem.—J. A. MEYERS, M.D., University of Minnesota, Medical College.

There were 22 cases of rabies in man and more than 10,000 cases in animals (80% in dogs) in the United States in 1947.—A. L. BRUECKNER.

African Veterinarian Visits America

The process in the manufacture of the Sharp & Dolme's dried brucella abortus vaccine used to combat brucellosis in cattle is explained to Dr. Gilles Van de Kock (second from left), Deputy Director of Veterinary Services, Union of South Africa, by N. H. Harrington (left), a department manager for the company's biological laboratories at Glenolden, Pa. Dr. S. F. Scheidy (right), Veterinary Medical Director of the laboratories was guide to Doctor de Kock when he visited the laboratories in January.

Doctor de Kock is in the United States to study recent research developments in the field of veterinary medicine. His plan was to return to South Africa by air late in January.

Streptomycin An Effective Treatment for Plague

Five patients, who were at the point of death in the plague hospital, Madras, India, were given streptomycin. Within 36 hours of the beginning of the treatment they regained consciousness and after that recovered rapidly.

A veterinarian, Dr. Karl Meyer of the University of California, was the first to suggest the use of streptomycin in the treatment of plague. This suggestion was based on his experience in the use of streptomycin in mice that had been inoculated with *Pasteurella pestis*.

A plentiful water supply should be provided for all animals that are being given absorbable sulfa drugs. That includes all of those commonly used, except sulfaguanidine, sufasuxidine and sulfathalidine.

Gammexane Objectionable for Poultry

Benzene hexachloride (gammexane, 666) the new acaricide successfully used in the treatment of sheep scabies during the past season, without injury to the sheep or the wool or to the palatability of the flesh, acts differently on poultry meat.

Hixon and Muma (*Science*, Oct. 31) kept chickens for two weeks in a house, the inside of which had been sprayed with gammexane, then killed and cooked them. The flesh was so ill-flavored as to be inedible. The same effect was obtained from spraying the chickens with gammexane.

Harwood (*Science*, Jan. 30, 1948) contests the conclusions of Hixson and Muma, holding their interpretation of their experiment is unwarranted. "If one sprays a chicken coop with crude benzene hexachloride, he will find it a most unpleasant job. Furthermore eggs laid in the house or poultry confined to it will be tainted." However by using a refined gammexane Harwood was able to eradicate poultry lice and mites from poultry houses without tainting either eggs or flesh of the birds. "It (benzene hexachloride) has important advantages over nicotine preparations because it is more easily applied, is more effective, is cheaper and is less dangerous to the operator as well as to the poultry flock."

Parasites Outdo Shylock

Shylock is world renowned for his ability to take his pound of flesh but parasites are older, more experienced and more efficient. They use an amortization plan but like the usurers they exact such high rates that, although the parasitized host struggles and uses every means at his command he seldom regains his freedom unless he is endowed with some rare ability or is given outside aid. It is not enough to snatch the furbearer from his parasites by administering some miracle drug for he is weak and before he can take advantage of the "new deal" he is again beset by a hoard of parasites. In his weakened condition he can just feed his parasites but can put nothing away for a rainy day. When that time comes, pneumonia usually rushes in for the kill.—C. A. HERRICK in *American Fur Breeder*.

Milk yields of 22,212 Connecticut cows average highest for cows freshening in February and lowest for those freshening in July. The production of cows calving in the most favorable month exceeded that of those freshening in the least favorable month by 13.7%.—*Dairy Science.*

"Dry Bible" is given by the *Journal of Agriculture of South Australia* as the common name of botulism, in a warning that hay damaged by the current plague of mice in that country may cause the disease. Farmers that must feed mouse damaged hay to horses or cattle are advised to vaccinate their animals as a protection against botulism.

Disease Reporting Required in Australia

In the United States all attempts to obtain animal morbidity and mortality statistics by means of routine reporting have been directed to veterinarians. This follows the lead of the U. S. Public Health Service in obtaining vital statistics from physicians. However, this way has been fraught with considerable difficulty so far.

That there may be another way of getting this information is indicated by the *Journal of Agriculture of South Australia* in the following:

The Stock and Poultry Diseases Act requires that an owner of stock affected by any of the diseases and pests set out below must immediately notify the nearest stock inspector or the Chief Inspector:

Actinomycosis.
Anthrax.
Cancer.
Coccidiosis.
Contagious pleuro-pneumonia of cattle.
Contagious pneumonia of swine, including swine plague.
Fowl cholera.
Fowl lice, infestation with.
Fowl tick *(Argas persicus)*, infestation with.
Infectious laryngotracheitis (avian).
Infectious necrotic hepatitis (black disease).
Mange of pig.
Mycotic dermatitis.
Necrotic enteritis (swine paratyphoid).
Pullorum disease (bacillary white diarrhea).
Sheep lice, infestation with.
Sheep tick *(Melophagus ovinus)*, infestation.
Sheep itch mite *(Psoroptes ovis)* infestation.
Spirochetosis (avian), poultry tick fever.
Stickfast flea *(Echidnophaga gallinacea)*, infestation with.
Swine erysipelas.
Tuberculosis.

In all cases where an owner has reason to suspect that his stock are affected by one of the above complaints it is his responsibility to notify an inspector or the Chief Inspector of Stock, even if he is uncertain whether the disease is one that is prescribed under the Act.

New Cold Virus Found

Discovery of the cold germ or rather *a* cold germ, for there may be others, has been announced at the National Institute of Health, Washington. It is a virus and has been grown for a year in chick embryos. The name given this virus of a "mean cold" is V14A (volunteer 14, first collection). It is different from the influenza virus. When V14A was sprayed into the noses of 60 healthy men, 57 of them contracted a mean cold.

Antihistamine Prophylaxis of Colds

Capt. John M. Brewster, medical officer at Great Lakes naval training center, is reported to have been conducting clinical experiments for a year on the treatment of colds with the antihistamine drugs, benadryl, pyribenzamine and phenylene, and to state that persons who feel themselves coming down with a "head cold" usually can be relieved of all symptoms within one-half hour if they will take one of the antihistamine drugs. He advances the theory that a cold starts as an allergic reaction and infection is secondary. Relieving the allergy at the start avoids the later developments.

The Grasselli Chemicals Department of the Du Pont De Nemours and Company announces the creation of a Veterinary Chemicals Division to handle the manufacture and sale of veterinary chemicals.

Chloromycetin Added to Chemotherapy

Chloromycetin, a new antibiotic made from a species of Streptomyces isolated from a sample of mulched field near Caracas, Venezuela, is reported to be 100% effective against *M. tuberculosis* and *Br. abortus* under experimental conditions. It also showed marked activity against typhus, psittacosis, some types of pneumonia, and rickettsial pox in experimental animals.

Army Medical Department Tests New Wonder Drug

The U. S. Army Medical Department soon will stage the most extensive test yet made of the efficacy of chloromycetin, the only drug thus far discovered which is as effective against certain rickettsial disease-causing organisms as the sulfa drugs and penicillin are effective against bacteria. The test will be made in an effort to stop the spread of the dreaded scrub typhus in the Far East.

A Veterinary Motion Picture

"Valiant Years," a motion picture sponsored by the Associated Serum Producers, which has been in production for nearly a year was released, coast to coast, in February. It was produced by a professional cast and should be of great interest to every veterinarian. It portrays a veterinarian's 50 years service in a typical American community. In terms of the community in which he is practicing it tells in part some of the great achievements of veterinary medicine and their relationship to the welfare and to the prosperity of the nation, and to the nation's animal owners. Interesting highlights in the dramatized action of the picture are:

Animal disease conditions before the advent of modern veterinary service.

Advances in the field of veterinary education.

The fight against bovine tuberculosis and its relation to human health.

The conquest of tick fever and what it has meant to the nation.

Hog cholera then and now.

Better care for small animals.

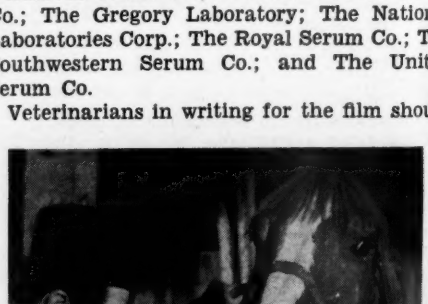
The contributions of veterinary science to better food, better clothing, better health and greater prosperity.

"Valiant Years" is being released through 26 film exchanges throughout the nation, starting in February, and is expected to be viewed by upwards of more than one million movie goers in the coming 12 months. Special efforts will be made to reach farm meetings, 4-H club groups, vocational agricultural groups, civic clubs, rural road shows, and women's clubs. Approximately 100 prints of the film will be in constant use in giving it nation-wide coverage.

The picture is also available to veterinary groups, and to individual veterinarians for showing in their own communities. Prints for such purposes may be had by writing Associated Serum Producers, Liberty Building, Des Moines, Iowa, or the home office or branches of any of the following member companies: Allied Laboratories, Inc.; Blue Cross Serum Co.; Corn Belt Laboratories, Inc.; Fort Dodge Laboratories, Inc.; Grain Belt Supply Co.; Jensen-Salsbery Laboratories, Inc.; Liberty Laboratories; Missouri Valley Serum Co.; Norden Laboratories; Pitman-Moore Co.; Sioux City Serum Co.; Sioux Falls Serum Co.; The Columbus Serum Co.; The Corn States Serum Co.; The Gregory Laboratory; The National Laboratories Corp.; The Royal Serum Co.; The Southwestern Serum Co.; and The United Serum Co.

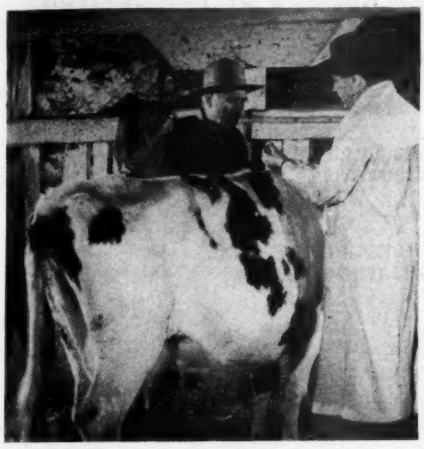
At left and below and on the opposite page: Scenes from "Valiant Years," the new veterinary motion picture

Veterinarians in writing for the film should write on their professional letterheads, and should state the exact date and place where



they wish to show it, and the type of group to whom it is to be presented.

This new use of motion pictures for public education is another step in the continuing public relations program on behalf of the



veterinary profession which Associated Serum Producers have been conducting for a number of years. Official spokesmen for the association emphasize that this new move in no way affects other national phases of the program in newspapers, farm papers, radio and other media throughout the nation.

Erratum

Through an inexplicable error the wrong caption was used under the half-tone illustration in the excellent clinical report of Dr. Philip Haims in the second column of page 38, January, 1948, issue. The caption should read: Microscopic section of vertebral chondroma in a dog.

Improved Wound Treatment

The mortality from chest wounds in World War I was 24.5%; in World War II 8.1%. This lowest mortality in history for thoracic wounds is attributed, not to novel surgical technics, antibiotics or sulfa drugs, but mainly to prompt treatment, resuscitative measures (treatment for shock) and judicious timing and selection of surgical procedures by qualified surgeons.

Shock is commonly associated with abdominal injuries also, and is the most lethal factor in them. Towery in a review of 957 cases of gastrointestinal perforation, found the systolic blood pressure at the time of admission below 100mm of mercury in 53% with a mortality rate of 48%, whereas in 47% with the blood pressure above 100 the mortality rate was 18%. From a review of the experience in the Mediterranean theater, 60% of the deaths following abdominal injuries were directly attributed to shock.—P. R. IMES, M.D., in *J. Am. Med. Assn.*, 135:13, p. 814.

Ascaris, hookworms, and lung worms are common in mink, but tapeworms are seldom a problem on mink ranches.

Dr. E. F. Knipling, USDA, announces the synthesization of a chemical (2-pivalyl-1, 3-indandone), which when fed to rabbits at the rate of 0.1mg per day renders their blood so toxic to lice that it killed 100% of these parasites which fed upon blood of the animals. The toxicity of the blood persisted for more than a month after administration of the chemical was discontinued. During this period a single feed upon the blood of the treated rabbits was promptly fatal to lice. The experiment is being continued with the object of developing a chemical that will be harmless to animals and yet kill ticks that feed upon them. The value of such a drug in the control of anaplasmosis in cattle, paralysis in sheep and dogs and other diseases of which ticks are vectors is obvious.

New Treatment for Cancer

Figuratively with a blare of trumpets it is announced that under the auspices of the American Medical Association, "a new way of treating cancer is to be tried on a large scale at cancer clinics all over the country" (S.N.L.). The "new way" consists of the use of sex hormones in cancer of the breast and of the bones in women, and castration and sex hormones in carcinoma of the prostate in men.

What the announcements don't tell, nor will tell, is that both treatments—hormones and castration—for neoplasms are veterinary discoveries. Castration for enlarged prostate (malignant or otherwise) in dogs has been practiced for 25 years, but is now largely superseded by the use of hormones. The use of hormones in the treatment of carcinoma of the mammae in bitches has been practiced in a limited way for several years although fully described[1,2,3] in the literature only recently.

[1] Beckman, C. H. Sexual hormones is the treatment of mammary tumors in aged bitches. *Vet. Med.*, 40:1, pp. 20-23 (January), 1945.
[2] Beckman, C. H. Sexual hormones in the treatment of prostatitis and neoplasms in aged dog. *Vet. Med.*, 40:7, pp. 235-237 (July), 1945.
[3] Beckman, C. H. Hormone treatment of apparent senility in dogs. *Vet. Med.*, 42:5, pp. 174-176 (May), 1947.

Of a total of 59,000 swine in Los Angeles county, California, 50,000 are garbage fed, on 38 garbage feeding premises.

Vesicular Exanthema

There were 13 outbreaks of vesicular exanthema of swine on garbage-feeding ranches in Los Angeles county, California, during the 1946-1947 fiscal year.

The disease was more virulent than the outbreaks which occurred during the last few years. The symptoms and lesions are identical in appearance to those caused by foot-and-mouth disease in swine. They include temperatures up to 108° F., vesicular eruptions on the snout, in the mouth, under the foot pads, and around the coronary bands, and on the teats and udder. It is necessary therefore to establish complete quarantine procedures on every premise where the disease appears. These are enforced until animal inoculation tests have been conducted to establish the identity of the disease. Cattle are still the animal of choice for inoculation purpose in order to differentiate vesicular exanthema from foot-and-mouth disease.

SUSCEPTIBILITY OF SPECIES

VIRUS	HORSE	BOVINE	SWINE	GUINEA PIG
VESICULAR STOMATITIS	+	+	+	+
VESICULAR EXANTHEMA	±	−	+	−
FOOT-AND-MOUTH DISEASE	−	+	+	+

Clinically the three vesicular diseases named above are indistinguishable. Differential diagnosis is aided by the differing reactions of the horse, ox, pig and guinea pig to inoculation

Guards are used on all infected premises until the tests are completed. Quarantines are maintained for a minimum of 30 days, or longer if unhealed lesions of the disease are present. Extreme caution is used in every outbreak on account of the presence of foot-and-mouth disease in Mexico.

Deaths due directly to vesicular exanthema among baby pigs are usually low, but losses from secondary conditions such as pneumonia, and starvation are frequently observed. During the outbreaks this year, losses in suckling pigs amounted to 350 on one ranch. Shedding of all hoofs on heavy hogs was not uncommon. One rancher estimated his loss from this disease to be in excess of $20,000, and other infected ranches had losses in proportion to the number of swine involved. Therefore, the overall picture is one of great economic importance.

RESULTS OF INOCULATION

VIRUS	ROUTE OF INOCULATION		
	LOCAL	INTRAMUSCULAR	INTRAVENOUS
VESICULAR STOMATITIS	+	−	±
VESICULAR EXANTHEMA	+	±	±
FOOT-AND-MOUTH DISEASE	+	+	+

Inoculation procedures and their interpretation are exacting and only those with technical knowledge and experience should assume the responsibility of making final diagnoses. The occurrence of any vesicular disease, at this time, should be reported immediately to the state livestock sanitary authorities or to the B.A.I. Inspector in Charge for the area

A state regulation governing all garbage feeding ranches was put in effect in March, 1947. Under its requirements there must be no removal of swine from any ranch until an inspection has been made of *all* swine on the premises by a representative of the federal, state or county livestock regulatory authorities. A release may then be issued for shipment of a definite number of swine within 24 hours of the time of inspection.—*Annual report, 1946-47, Livestock Department Los Angeles County, California.* L. M. HURT, *County Livestock Inspector.*

It is important in swine diagnostic work never to forget hog cholera when examining a cholera-susceptible herd. If the animals have been properly immunized, one should seek further and deeper for the cause of the trouble. Sound prophylactic immunization against hog cholera, therefore, has a threefold effect: (1) It prevents hog cholera. (2) Each immunized herd is a barrier to the spread of the disease, and (3) hog cholera immunization diminishes the often costly confusion and delay in the diagnosis of other ailments of swine.

During the past 10 years we have encountered many cases where piglets have died due to receiving excessive doses of iron given for the prevention of anemia.—*Rept. Ontario Veterinary College*, 1942.

Young pigs need clean, dry and relatively warm quarters, plus a plentiful supply of good milk. And good milk depends on adequate rations for the sow.—J. C. KAISER.

Streptococcic Septicemias

Septicemias that are probably caused by various types of streptococci are encountered in swine. It is difficult to distinguish these infections from other septicemias. One type which has been encountered frequently of late years, seems worthy of a brief description because streptococci have been isolated regularly from these cases.

Symptoms.—There is inappetence, elevated temperature (104° to 107° F.) and loss of weight. The animal is alert, clear eyed and active when aroused. There is no staggering, no coughing and, as a rule, no diarrhea. Often, blood is passed in the urine.

Necropsy.—The lesions observed on postmortem examination are those of a very profuse generalized septicemia. The lymph glands are enlarged and dark. Hemorrhages, large and small are everywhere, even in the cutaneous, sub-cutaneous and muscular tissues. Sometimes the tonsils are ulcerated. The most characteristic finding when encountered is a renal lesion; the hilus of the kidney being a mass of blood; black in places. This may extend down the ureters and into the bladder. At times the mucous lining of the urinary bladder is a mass of these large blood-blister-like lesions. The same lesions have been found in the gall bladder. The blood is often very thin, and the animal anemic. This disease appears not to spread from farm to farm.

Certain types of porcine bacterins are beneficial in checking losses from this type of septicemia if they happen to contain the right strain of the causative organism. Good results have been reported also from the use of sulfanilamide. Perhaps sulfamethazine or sulfamerazine would be even more effective. A double dose of hog cholera antiserum and a regular dose of hog cholera virus should be given at the same time as the bacterin if the animals have not already been immunized against hog cholera.

Types of Swine Enteritis

The death losses of small pigs constitute the major problem in swine raising today. Indeed, swine losses associated with enteritis and diarrhea apparently surpass all others.

The known diseases characterized by enteritis and diarrhea, for convenience are divided into two groups, those caused by infection, and those caused by deficiencies. The former include infectious necrotic enteritis caused by *Salmonella choleraesuis*, swine dysentery possibly caused by a vibrio, enteritis associated with *Balantidium coli*, coccidiosis, transmissible gastroenteritis, and enteritis caused by a virus. The deficiencies include those of vitamin A, thiamin, riboflavin, niacin and tryptophane, pantothenic acid, pyridoxine, and unknown water soluble substances found in liver and in yeast.

A group of pigs suffering from enteritis. The death loss from enteritis is great, but even greater is the loss from stunting and delayed fattening.

There is also a condition or conditions variously known as "baby pig disease," "uric acid infarcts," "hypoglycemia," "toxemia," "three day disease," etc., which cause losses among young pigs. There is no easy method of differential diagnosis for this latter group of diseases, and the causes of some of the conditions are not known.

Conditions as they now exist are a serious threat to the swine industry, because new diseases are affecting swine and research on swine diseases has always been neglected, so that very little is known of control measures for the new diseases, not enough is understood regarding known diseases, and there apparently remain old diseases of swine which are still unrecognized.—S. H. MCNUTT and PAULO DACORSO, Madison, Wisc.

Chloroform the Anesthetic of Choice for Large Animals

By W. B. HIRLEMAN
Waynesboro, Georgia

ALTHOUGH the veterinary profession has made remarkable progress during the past 25 years in all branches of practice, in the field of small animal surgery its progress has been phenomenal. This can be attributed mainly to the possession of a satisfactory anesthetic for use in small animals. Large animal surgery has not kept pace with the advance of small animal surgery, mainly because of the lack of a safe and efficient agent with which to anesthetize horses, mules and cattle. The various chloral compounds and combinations have proved fairly efficient for producing narcosis in the large farm animals, but do not provide the safe degree of anesthesia with complete relaxation which we enjoy in small animal surgery with nembutal and similar agents.

Surgery, attempted on a patient whose sensibilities are merely blunted and who is trussed up like a christmas turkey to resent and fight every invasion of the knife, becomes butchery rather than surgery. A struggling, resisting patient filling the air and surgical field with dust, hair and litter nullifies all efforts at asepsis, precludes delicate surgical technic and convinces onlookers that veterinary practice is not so far removed from the horse doctor stage.

We have had at our disposal for a century, an agent which is safe, practical, inexpensive and highly satisfactory for use as an anesthetic in large animals, but which all of us have been reluctant to use. That agent is chloroform. Extensive training is not necessary to become proficient in the use of chloroform. A few trials will convince anyone that it is far safer and more satisfactory for our large farm animals, than any other agent we, as yet, possess. If one injects too much chloral there is no means of removing it, but chloroform anesthesia is a progressive procedure and should too much be administered all that is needed is to discontinue momentarily and after a few breaths of air the animal is ready to continue.

A few trials on some animal which is to be destroyed will supply the requisite experience and convince anyone of the relative safety of chloroform anesthesia in large animals. In experimental euthanasia, after the anesthetic state has been carried too far, respiratory paralysis follows and a complete cessation of breathing is noted, however, the heart continues to function for quite some time after this. If the administration of chloroform is discontinued at this point respiration is soon resumed. It is possible to revive the subject by the simple means of removing the chloroform one, two and even three minutes after all visible breathing has ceased. Air is the antidote to chloroform and a generous supply should be admitted along with the drug. Should respirations not be resumed in a reasonable time, pumping of the chest with the foot at slow regular intervals will usually suffice to re-establish respiration.

In our practice we never use casting harness but do our major operations as follows:

To tractable animals, we administer just

enough chloral and magnesium sulphate to blunt the sensibilities (just beginning to stagger), which removes any resentment on the part of the animal to the vapor of chloroform and complete anesthesia is then easily obtained. In unbroken range colts or nervous animals, which may displace the needle from the vein, we dispense with the basal narcotic and, after snubbing to some secure post, start

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the anesthesia with chloroform. The most satisfactory mask so far employed has been a clean, dry feed sack, doubled twice and fitted under the nose band and chin strap of a stout rope halter. About an ounce of chloroform is poured on the sack over the nostrils, and repeated in 30 seconds. Usually this is sufficient to produce complete recumbency, when additional chloroform can be added as needed. In operations of short duration, as castrations, removal of small tumors, suturing wounds, etc., no extra chloroform need be administered. By a little attention to respirations the operator can indicate to the owner when and how much of the drug to add as he is operating. Of course if one can have another veterinarian to act as anesthetist one can give one's undivided attention to the surgery. In this case animals can be kept anesthetized safely for the duration of any major operation, without any restraint whatsoever and yet be on their feet in 10 minutes after the operation is completed, without any struggling or staggering.

We have never had a fatality from this type of anesthesia nor have we experienced any pulmonary irritation or other untowards results. Most of the reputation that chloroform once had for causing pulmonary irritation and respiratory collapse derived from days when giving chloroform vapor undiluted was advocated. At that time air was shut off as much as possible in an effort to produce quick anesthesia. This method has been abandoned with a result the percentage of fatal accidents has gone away down.

Much has been written about the irritating properties of chloroform on the skin and nasal mucous membranes but this was observed under the old method of using a saturated sponge in the nostril after the patient was cast. In the standing position using the feed sack little of the drug ever comes in contact with these structures as the admixture of air as it is drawn through the open mesh of the sack by inhalation vaporizes the liquid before it reaches the nasal passages and we never see any irritating effects of the drug.

I do not mean that chloroform is not a dangerous drug. It is. But chloral and all of its combinations are more dangerous and not nearly so satisfactory as anesthetics. When chloral hydrate and magnesium sulfate are used as a basal anesthetic one gets all their advantages without their disadvantages (incomplete relaxation and slow recovery) and dangers.

The late Dr. Downs, Mt. Sterling, Ohio, used this method of anesthesia for castrations for years and found it satisfactory and it was from him that we adopted it with some modifications. We also find it indispensable in the castration of large and vicious boars.

Foot-Rot and Foot Abscess in Sheep

As considerable difficulty appears to exist among sheepowners living in the higher rainfall areas of the State in deciding whether their sheep are affected with foot-rot or foot abscess, the points of difference between the two conditions are set out in the following table prepared by Mr. W. S. Smith (Veterinary Officer, Dept. of Agriculture, South Australia).

Comparative Descriptions of Foot-Rot and Foot Abscess

Foot-rot (Epizootic panaritium)	Foot Abscess
Due to *Fusiformus nodosus*.	Due to *Fusiformus (Actinomyces) necrophorus*.
Highly contagious.	Non-contagious.
Associated with wet conditions.	Associated with very wet conditions.
Spreads from infected to healthy sheep.	Cause is normal soil inhabitant which gains entrance when horn is softened or injured.
Affects up to 90%.	Seldom affects more than 10%.
Attacks sheep of all ages.	Nearly always confined to older sheep.
Both claws of any or all feet.	Usually only one claw of one foot.
Starts at heels and causes separation of horn from underlying tissue.	First sign is lameness. May be scald between toes or around coronet.
A little greyish evil smelling pus under horn only.	Paring of toe or opening coronet reveals a large amount of creamy, thick pus.
Does not involve coronet or deeper tissues such as bone and ligaments.	Involves coronet and deeper tissues with occasionally channels running up to fetlock.
Treatment consists of cutting away all undermun horn and then putting through foot bath of 10% formalin or bluestone.	*Treatment.*—Careful paring of hoof, particularly the toe to release any pus; opening any abscesses to provide drainage, and then putting through foot bath.
Affected cases must be isolated to prevent spread.	Isolation of affected cases not necessary.
Prevention.—Care in purchasing new sheep that they are free of foot-rot as shown by lameness in winter and deformed feet in summer. Leaving pasture on which infected sheep have been running vacant for seven days is sufficient time to allow for the causal agent to die out.	*Prevention.*—Trimming of feet to prevent overgrowth and provision of dry standing. Excessive yarding should be avoided, as the causal germ is more prevalent in mud mixed with manure.—*J. Agr. S. Australia.*

Notes on Brucellosis Control and Interstate Health Certificates[1]

By J. V. KNAPP
Tallahassee, Florida

THE Bureau of Animal Industry of the USDA was created by Congress in 1884 to foster the livestock industry of the United States. This function was approached from two angles: first the eradication and control of dangerous transmissible diseases of livestock, and second to prevent the introduction and spread of such diseases into or within United States.

The authority of the federal government to impose quarantine restrictions governing the importation of domestic animals to prevent the introduction of disease or to regulate interstate commerce in livestock to prevent its spread was not questioned. The authority of states to enact laws and promulgate rules and regulations governing the admission of livestock was at first questioned, but is now generally conceded. Therefore we have the federal government and the several states cooperatively conducting a program of disease eradication and control and regulating interstate movement to prevent the spread of transmissible diseases of animals.

From experience gained in handling these problems through the years, the present-day, official interstate health certificate has been developed, standardized, and is now universally accepted as the legal instrument, when completely and adequately accomplished, to convey authority for the movement of livestock from one state to another. The 1944 report of the United States Livestock Sanitary Association gives the following definition for an official health certificate:

"An official certificate of health means a legible certificate, made on an official form from the state of origin or from the United States Bureau of Animal Industry, issued by veterinarians in the employ of the United States Bureau of Animal Industry, accredited veterinarians or licensed graduate veterinarians from a college which has been recognized by the American Veterinary Medical Association, and which veterinarians are approved by the recognized livestock sanitary official of the state of origin."

The report also states that a health certificate shall contain the name and address of the consignor and consignee, with an accurate description or identification of the livestock. In other words it should be legible and fully accomplished. It is void 30 days after date of issue. But to my mind a health certificate means much more than that. It should mean that the veterinarian issuing the certificate has performed a professional service for his client, generally the consignor, and a like service for the state of destination as its agent, for such he is when he certifies that the livestock covered in the certificate meet the requirements of such state.

When a veterinarian is requested to furnish a health certificate he should feel that he is being employed to perform a professional service and this service should receive the same conscientious handling as any other professional duty, and the manner in which it is performed reflects his character and integrity. He should determine first the class and number of animals to be moved (steers, heifers or hogs), purpose of movement (slaughter, breeding or dairy) and state of destination. He should then refer to circular No. 2, State Sanitary Requirements Governing Admission of Livestock issued by the U. S. Live-

The present-day official health certificate has been developed, standardized, and is now universally accepted as the legal instrument to convey authority for the movement of livestock from one state to another

stock Sanitary Association (now in hands of printer) and determine the specific requirements of that particular state for the species, class, purpose and type of animals being moved, as there is no rule of thumb for the issuance of official health certificates.

Having reviewed thousands upon thousands of health certificates issued by veterinarians in every state of the Union during the last 25 years I have reached the conclusion that the veterinary colleges are not making the issuance of health certificates a vital part of their curricula, *i.e.*, students are not sufficiently impressed with the responsibility, that will be theirs, in the interstate movement of livestock. The rules and regulations governing the admission of livestock as set forth in the current circular and in preceding circulars, are not used in class-room studies and, therefore, not read and understood by the student.

[1] Presented at the 18th annual meeting of the Florida State Veterinary Medical Association, St. Augustine Oct. 27 and 28, 1947.

Using Nutritional Knowledge In Practical Dog Feeding[1]

C. M. McCAY*
Ithaca, N. Y.

MAKING use of current information in practical dog feeding is very difficult first, because such knowledge is widely dispersed in technical journals and secondly, because most experiments have been performed for periods that are much too brief and upon mongrel dogs whose age and physical condition are unknown.

There are several thousand books dealing with dogs. The bibliography of the Chapin collection, now owned by the college library in Williamsburg, Virginia, comprises a whole book in itself. However, this whole collection contributes little to a workable knowledge in the feeding of dogs. Books on the subject are largely collections of misinformation and prejudices written by untrained men.

Nutrition articles in the average dog magazine are of little help. They also are usually either summaries with little scientific background or hackneyed presentations of current nutritional knowledge based largely upon research with rats and not dogs. The Germans about 15 years ago established a magazine devoted to dog research, the *Zeitschrift für Hundeforschung*. This started with a few good reports but the journal soon died as the Hitler regime came into power.

Today in America, the dog population is estimated at 15 to 20 millions. The money involved in rearing, feeding and maintaining these dogs must be well in excess of a hundred million dollars. Under such conditions most other industries would devote 2% or more of the gross sum to research. This would amount to more than two million dollars annually. However, very little is spent in our nation for research upon dogs. A few manufacturers of commercial feeds maintain test kennels. Universities in a few cases make limited studies upon dogs. Millions are spent for advertising dog feeds but almost nothing for research. It is very difficult for the typical feed manufacturer to test his product rigidly because such testing means a certain percentage of sick and dead dogs. Visitors and boards of directors prefer beautiful show dogs. Therefore, genuine testing can seldom be done.

Support for research upon dogs is also difficult to obtain in colleges of agriculture because there is no organized pressure to secure appropriations from legislatures and because administrative officers in such colleges do not consider dogs as farm animals.

Research upon dogs, however, is very important not only for advancing our knowledge of feeding the dog itself but also to advance the basic sciences that provide the foundation for nutrition and medicine.

There is special need for long time nutritional research upon pure breeds of dogs. There is good reason to believe that variations in nutritional requirements may have been selected with other characteristics of specific breeds. The unique uric acid metabolism of the Dalmatian indicates that the chemical metabolism has unwittingly been an associated factor with other characteristics of this breed. Certainly, then, we can expect similar variations in nutritional requirements.

Today many researchers believe that increased efforts should be made to domesticate more experimental animals. Each species may prove superior in a given field of testing. The fact that the guinea pig is the only one of the common laboratory animals that gets scurvy has aided greatly in advancing our knowledge of vitamin C. Among the newer small animal species that are becoming common in laboratories today are the hamster and the cotton rat. Both are finding specific uses. As the knowledge of nutrition of the dog increases it is very likely that we will discover divergent requirements of the various breeds.

During the past year we have been establishing in the Animal Nutrition Laboratory at Cornell a unit for nutritional research upon dogs. We have been assigned a former dairy farm with a large barn and house. This barn is being converted into kennels. As soon as these kennels are ready we plan to start a series of projects with the following objectives:

1. To use old dogs of known age and history in research in the field of gerontology.
2. To determine the nutritional factors most important in the maintenance of bones and teeth.
3. To study growth rates in relation to skeletal development.
4. To study the interrelationship between diet and skin diseases.
5. To determine the effects of exercise upon the nutritional requirements of the dog.
6. To improve commercial and other practical feeds for dogs.

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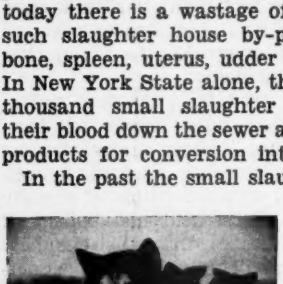
*Animal Husbandry Department, Cornell University.

In the improvement of practical feeds much attention needs to be given to making them attractive to dogs. Furthermore, there is need to find ways of putting more fat into the diet of the dog especially those fed meals or biscuits. At present this is not considered practical because of the development of rancidity and the staining of packages by fat.

Although no one can foresee the expansion of the market for frozen dog feeds, this will probably prove substantial. In the nation today there is a wastage of vast tonnages of such slaughter house by-products as blood, bone, spleen, uterus, udder and other organs. In New York State alone, there are about one thousand small slaughter houses that run their blood down the sewer and sell these other products for conversion into tankage.

In the past the small slaughter house could not afford to can these products into dog feed because canning requires expensive equipment and careful laboratory control. The conversion of these by-products into frozen dog feed, however, is a relatively simple operation that requires no expensive equipment. Therefore, these slaughter houses may find themselves in a more favorable position to compete with larger units.



Sled dogs are often fed corn meal mush

We have made preliminary studies of both raw and steamed blood as a dog feed. We have not discovered how to work it into a feed to yield a maximum value. Although blood has long been used as both human and animal food, little is known about its nutritive value. It is rich in protein, however, its nutritive value deteriorates readily in the course of drying, especially when exposed to high temperatures. Short-time studies by Germans during World War I indicated that blood is well digested, but longer feeding trials by us with dogs indicate that it is not satisfactorily tolerated when fed continuously for four months.

Another product that may find extensive use in frozen dog feeds is ground bone, either raw or steamed. The composition of green butcher's bone as given in the Yearbook of Agriculture for 1939 is moisture 52%, ash 16.3%, crude protein 16.6%, and fat 17%. Almost no attention has been given to the use of whole bone as food or feed in modern times. Some studies made a century ago indicated that dogs could be maintained upon raw bones for several months but they died in a relatively short time if these bones were cooked.

When bone and blood are developed into frozen feeds they will probably be combined with plant products such as wheat flakes, corn flakes and soy meal. With the exception of the last which is used as a source of protein, the others provide cheap energy in the form of starch.

This introduces the very important problem of the place of carbohydrates in the diet of the dog. The question is often asked if dogs can digest starch. All evidence indicates that dogs can utilize the same carbohydrates as man, including cooked potatoes.

Most of the dry meals on the market today are made up with 50 to 60% of either corn or wheat. Usually this is in the form of flakes since many of these mixed dog foods were started originally from cereal breakfast foods. In some plants, corn and wheat flakes are made today solely for dog feed. The by-products of breakfast foods such as shredded wheat are also used.

Some of the dry meals incorporate large amounts of bread crumbs from slicing machines and stale bread. The biscuit types of feed are made by mixing other ingredients such as horse meat into a dough with wheat flour and baking the mixture.

During the past year much interest in the feeding of flour and bread products to dogs has been aroused by the experiments of Mellanby in England. Last December, Mellanby reported that dogs, fed mixtures containing substantial amounts of flour bleached with nitrogen trichloride, were subject to fits after a few weeks upon the diet. The cause was traced back to the bleaching agent. Since this is the most widely used bleaching agent both here and abroad, much interest was created among flour millers.

Mellanby's work was repeated in several American laboratories. It was verified in every case. Various theories were elaborated concerning the reason the bleaching and oxidizing agent produced such a change in the flour. At first it was thought to be an alteration in the gluten since the chief purpose in using this bleaching agent is to age and strengthen this protein of wheat. A little later another

laboratory thought the effect of the oxidizing agent was upon the fat of the flour. More recently another worker has claimed that the sulphur-containing amino acids of the protein of the wheat are oxidized producing products that lead to fits in dogs.

Fortunately the large manufacturers of dog biscuits have long used unbleached flour. No one knows for certain the effects upon dogs of feeding large amounts of bread made from bleached flour. In fact no one knows what this is doing to our people in America.

The millers are now talking about shifting to another oxidizing and bleaching agent that will not produce a flour that will give fits to dogs. No one knows what it will do to dogs or man. The sensible program would be to shift to unbleached flour entirely and protect the American public. Long ago Wiley fought for this and failed. Perhaps we can progress no further today until the housewife refuses to buy bleached flour or bread made from it.

For long periods dogs, both here and abroad, have been fed plant products. Sled dogs are often fed corn meal mush. Scotch dogs have been fed oatmeal. A Swedish visitor recently told me that their dogs were now fed largely potatoes and milk.

There is no doubt that the dog utilizes these plant products and they are economical. Far more potatoes could be used in the feeding of dogs. This practice is especially important when grain products are limited in supply or expensive.

A well designed dry dog meal has a substantial margin of safety in supplying essential nutrients. In a mixture of the following composition we ran some tests using white rats to determine the possible dilution: Alfalfa 1.5, meat scrap 23.7, fish meal 1.5, soybean oil meal 6.5, tomato pomace 1.5, corn and wheat flakes 50, wheat germ 8, dry skim milk 3, "G-an-En" 2, salt 0.2, dicalcium phosphate 0.7, dry brewers yeast 1, irradiated yeast 0.05, cod liver oil concentrate 0.03, vitamin A oil 0.62, and "livex 800." We tested this meal both when diluted with an equal weight of corn starch and also with corn meal. Rat growth was normal when we added one part of the starch to one of the meal but failed if we mixed three parts of meal and one of starch.

Meals of many of the reliable companies would stand such dilution. Of course one possible error is that our tests were made upon rats and should have been done with puppies. In time such studies must be made with dogs.

The results, however, are probably sufficiently sound to justify dilution of dog meals with potatoes in case feeding-stuffs become very expensive or difficult to obtain. It is likely that dogs could be maintained in excellent health for many months or even longer if a good meal were fed, mixed with five times its weight of boiled potatoes. This is roughly equivalent to mixing the meal with an equal weight of starch since boiled potatoes are about four-fifths water and one-fifth starch.

We have fed substantial amounts of potatoes to dogs and believe a dog feed would be very satisfactory if made with half its weight of cooked, dried potatoes and the other half of the usual ingredients such as meat scrap. Much of this meat scrap is so poor today and contains so much bone that some manufacturers have ceased using bone meal in their formulas.

Among the other plant products that are commonly included in dog feed are wheat germ meal, soy meal, dried yeast and tomato pomace. The first three contribute protein as well as vitamins. Yeast is the richest source of the water soluble vitamins and is now readily available. Tomato pomace is usually added to help control diarrhea since it is rich in pectin. However, many manufacturers of tomato juice do not bother to dry this pulp and as a result the supply is limited.

Such plant products as alfalfa meal are commonly added to feeds as a source of carotene but no one has determined how well the dog utilizes this material from this product.

Feed manufacturers are awaiting eagerly the day when high quality meat meals, liver meal and bone meal become available again. Research workers hope some day to find a way of increasing the fat content of the meals and biscuits but that time is not in sight.

Florida could undoubtedly contribute much to the welfare of the nation's dogs if a careful study were made using many of the unique products of this state. In even a cursory survey one thinks of the citrus pectins and possible uses to prevent diarrhea and constipation, of yeasts grown on waste carbohydrates, of carotene from various plant sources, of protein from coconuts and of carbohydrate from potatoes. Much research is needed to learn the greatest value of these and many other products. In studying the nutrition of the dog and uses of special foods, much will be learned of value in human nutrition.

Finally, in addition to our need for more knowledge about these foods we need to learn more about the dog in relation to his food. How sound are the dog feeding practices used on your race tracks to insure optimum performance? How much of our problems of skin disease in both dogs and man are related to obscure interaction between special foods and weather conditions? These problems can be solved by research with the dog.

The Relationship of the Veterinarion to Public Health Work[1]

By WILSON T. SOWDER, M.D.*
Jacksonville, Florida

THE physician and the veterinarian are members of closely allied medical professions. We are allied by the fact that our basic training in the biological sciences must be identical, and the later training in the two professions must be parallel. We must all have struggled with chemistry, physiology, bacteriology, pharmacology, pathology, and therapeutics. In fact I stand in some awe of the veterinary medical profession due to the fact that you must have had to learn your anatomy, physiology, pathology, and pharmacology in relationship to not just one animal species, as I did, but in many. I had enough difficulty in gaining a smattering of knowledge about the course and relationships of the carotid artery, for instance, and the intricacies of the brachial plexus in the human species that I do not envy those who found it necessary to learn these facts for many species. I am still proud of myself for remembering that morphine acts a bit differently in dogs than in people (I hope my memory is correct in that), but I am glad that I did not have to pursue this subject to the other animals with which you are concerned, and to the several thousand other drugs in the pharmacopeia. Furthermore, since my graduation, from medical school I have adopted the strategem which is nowadays very popular among physicians, of avoiding responsibility for having too broad a knowledge in the field of human medicine by limiting myself to a particular field—public health. You can readily see the advantages of that; one gets credit for being a specialist and for having special attainments, but actually I am inclined to doubt if the total fund of information possessed by the specialist in general adds up to that of a well-trained, general practitioner.

However, be that as it may, neither I, as a physician engaged in public health work, nor any other physician so engaged, so far as I know, claims the field of public health for the medical profession alone. In fact medical men alone cannot unaided carry on a modern public health program. Such a program requires the cooperation and active participation of many professions, such as engineering, nursing, dentistry, nutrition, chemistry, bacteriology, parasitology, serology, pharmacy, entomology and, of course, veterinary medicine. The field of public health is broad and complex and requires, I must confess, the services of specialists in many fields.

The role of the veterinarian in public health is a most important one. This has been recognized for a long time, but in such varying degree, that it may be safely said that there has not been general recognition up to this time of the part that he can and should play. It is not generally known that there are, as Doctor Steele has pointed out, 75 diseases which may be transmitted from animal to man, and little thought, so far as I know, has been given by anyone to determining the extent to which man may be a source of infection to animals. The average physician in private practice gives little thought to the source, means of spread, or methods of prevention of disease, but treats his patients for whatever condition they may have, as they come to him. There has been a similar and extensive neglect, on the part of persons forming public health policies, of the epidemiology of diseases of man of animal origin. This we can no longer afford to do. That good to excellent results can be obtained, has been shown by the campaigns carried on, mainly by agricultural agencies, against bovine tuberculosis, glanders, foot-and-mouth disease, and psittacosis. The methods used in controlling these animal diseases are so much more familiar to you than to me that I shall not attempt to discuss them.

Let me mention, however, a few other animal diseases with which we are concerned to a greater or lesser degree today, such as: rabies, brucellosis, anthrax, taeniasis, salmonellosis, trichinosis, typhus fever, plague, ornithosis, fungous diseases, tularemia, leptospirosis, spotted fever, Q fever, and the encephalitides. It is now obvious that any health department, national, state, county, or municipal is either helpless or tremendously handicapped in carrying out its duty in protecting the health of the citizens from any of these, without the help of those trained in veterinary medicine. I shall not attempt to outline to this group all the things that a veterinarian may do in a public health agency. The functions of the veterinarian in the inspection of meat and milk, and in the control of rabies, to give a few examples, are too well

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*State Health Officer, Florida State Board of Health.

known to need elaboration. It would be presumptuous of me to attempt it. It is also obvious to us all that no health agency, federal, state, or local can be successful alone, even though adequately staffed with veterinarians, in carrying on all the veterinary phases of a public health program. Departments of agriculture, and other agricultural agencies must of necessity assume a large share of this responsibility. Also it would be trite to say that official agencies, whether health or agricultural, must have the good will and active help and cooperation of veterinarians in private practice, if they are to be successful; just as surely as a health agency must have the good will and cooperation of physicians in private practice in order to carry on other phases of the health program. I shall, however, speak further about this matter in a moment. I want first to go somewhat more in detail about just one of the problems of common interest to us. I refer to rabies.

I am sure that a good many of you saw the article on rabies appearing recently in the magazine *Newsweek* in which a very good summary of the national situation was given. Every year in this country around a half million persons are bitten by dogs, and although only perhaps around 10,000 of the dogs involved turn out to have rabies, and only 50 to 70 persons eventually die of the disease, they die a peculiarly horrible death and the sum total of human agony experienced is great. This problem deserves attention far out of proportion to what that number of deaths would ordinarily call for. Also attention should be called to the discomfort and economic loss incident to 30 thousand persons taking antirabies vaccine annually. The U. S. Public Health Service reports that we have the highest rabies rate in history and that there has been a 50% increase over pre-war figures. The importance and concern with which rabies is being viewed nationally is highlighted by a recent study of the subject by a committee of the New York Academy of Medicine. The report of this committee quotes Dr. H. W. Schoening of the Bureau of Animal Industry of the U. S. Department of Agriculture as saying, "Rabies is an outstanding example of a dangerous disease which could be controlled, or eventually eradicated in this country, but which is not under control because of failure to impose and thoroughly carry out uniform regulations."

The report of this committee goes on to say, "The prophylactic vaccination of animals is now a practical possibility." Studies made in Alabama by the Rockefeller Foundation in cooperation with the Alabama State Board of Health have shown that a single injection of 5cc of a potent vaccine will produce a high degree of immunity that is satisfactory for a year. They further note that successful field experiments are gradually dispelling the lack of confidence in vaccination. They make the further point, which I am sure will not be news to you, that the primary requirement in rabies control is the elimination of wandering and stray dogs, and that vaccination is needed as a supplementary measure. The committee made some specific recommendations which I shall summarize as follows:

1. There should be uniform national control measures, including the regulation of the entry of dogs and other susceptible animals into the country, and their transfer between the various states.

2. Animal and human cases should be reported to local and state health authorities.

3. Every state should require annual licensing of dogs, and licensing should be contingent upon annual vaccination.

4. Other control measures should be emphasized such as quarantine measures, the establishment of dog pounds, and an educational program aimed at gaining the support and cooperation of the general public.

5. Eliminate wild animal reservoirs where such exist.

You may very well ask me at this point, "What is the rabies situation in Florida and what is being done about it?" We do not have reliable statistics showing the occurrence of either human or animal rabies in past years in this state, but these are improving rapidly with the establishment of local health departments throughout the state. We have enough facts, however, to know that we face a situation here as serious as exists in any state in the Union. During the past six months we had alarming outbreaks of animal rabies in such widely scattered areas as Escambia and Santa Rosa counties in West Florida, and in Dade county in the southeast; in Hillsborough in the southwest, and right here in St. Johns county and St. Augustine. Dr. Herbert White, the city health officer, tells me that dogs are still under quarantine here and will be until November 1st. He has had four positive cases of canine rabies. Dr. T. W. Reed reported an outbreak in Santa Rosa county during March and April with five cases of canine rabies. Twenty-five persons underwent antirabic treatment there, and (mark this) the sheriff killed 400 ownerless and stray dogs in that one county. Doctor Reed reports further, "We had excellent cooperation in both counties (Escambia and Santa Rosa) from the local veterinarians. One excellent result from this rabies scare was obtained in the city of Pensa-

cola, in that the city council passed an ordinance making the vaccination of dogs compulsory, if the animals were allowed to run at large on the streets. The ordinance also made it mandatory that all stray dogs and those without vaccination tags be picked up and cared for at the Humane society's dog pound. Two or three hundred dogs were exterminated. The citizens of Pensacola and Escambia counties became very conscious of this disease." He goes on to say that he made three radio addresses in connection with the rabies outbreak; so it is no wonder that he received the cooperation of local populace.

The October issue of the *Bulletin* of the Dade County Medical Association states, "Rabies in dogs reached an epidemic stage in Dade county last month." Doctor T. E. Cato, the health commissioner, reported in a recent letter that 96 cases of animal rabies had been reported this year, and 204 persons had taken antirabies treatment, not including the large number who have taken antirabies treatments from their own physicians. He further reported, "The private veterinarians here have been very cooperative in the rabies control program. In fact the Dade County Veterinary Medical Association helped in procuring enactment of local ordinances requiring the licensing and compulsory vaccination of all dogs. They have helped in the educational campaign in informing the public by talks to several clubs and other groups and appearances before various governing boards; by statements in the press and over the radio. Within a period of about three weeks they vaccinated approximately 7000 dogs. . . . They have advocated a statewide rabies control law requiring the compulsory vaccination of dogs." Gentlemen, I need not say that a health agency could hardly expect fuller cooperation from a group of professional men, nor for that matter from any group of private citizens. I am sure that similar assistance is being received by our health departments throughout the state, and in behalf of the city and county health officers of the state, and in behalf of the State Board of Health I want to express our gratitude for this help. I think that the Florida State Veterinary Medical Association deserves the highest praise for having advocated a state-wide rabies control act, and although it was not passed at the last legislature, I have every confidence that with the continuing support of your Association, and that of health and other officials throughout the state we will be more successful next time.

Before leaving the subject of rabies I want to give you a few figures showing the number of examinations of animal heads for rabies made by our State Board of Health Laboratories.

RABIES EXAMINATIONS IN THE BUREAU OF LABORATORIES

Year	Examined	Positive
1942	546	211
1943	450	120
1944	548	171
1945	647	209
1946	574	172
Total	2765	883

I wish that time permitted me to go into detail about other diseases of common interest to the public health and the veterinary professions. We are, for example, still having entirely too many cases of brucellosis every year. The incidence of trichinosis is not known but it must be considerable, and it has been estimated by reliable authorities that the average incidence of trichinosis in humans in this country is 16%. Undoubtedly many persons die of this disease without it being recognized as the causative agent. Many hundreds of cases of typhus fever occur in this state every year, and the role of the rat in its transmission is well known. The State Board of Health in cooperation with the Rockefeller Foundation is now engaged in research in an effort to find better methods for controlling the disease. A veterinarian can undoubtedly add a great deal of help to the team engaged in this work.

As a result of our increasing awareness, of the part that the veterinarian can play in protecting the health of the people of the state, the State Board of Health will add a veterinarian to its staff at its headquarters in Jacksonville January 1st. Although we have had veterinarians on our central office staff before, their functions have been limited to milk inspection, and to advising local health agencies in this field. In the present instance, however, the function of our staff veterinarian will be vastly broader, in that he will represent the State Board of Health in the veterinary phases of all the diseases transmissible from animals to man. He will be assigned to the Bureau of Preventable Diseases and will collaborate with the state epidemiologist in the investigation and control of this group of diseases. He will act as our liaison officer to the veterinary medical profession, and to agricultural agencies. He will act as our consultant in his field to city and county health departments, and will promote and encourage better control measures throughout the state. He will aid local health departments in the recruiting of well qualified veterinarians in order to better carry on a good veterinary public health locally. In short he will do anything

and everything that shows promise of improving the health of the people of the state, and he will have a pretty free hand in determining what should be done. We believe that we are taking a progressive step by so doing and we think that Florida will be pointing the way to other states in this respect. I could not, however, let this opportunity pass for giving credit where credit is due for this idea. Members of your own Association have for more than a year urged this step upon us, and Doctor James H. Steele of the U. S. Public Health Service has offered weighty arguments that could not be ignored.

I know that you will all be pleased to learn that it is a member of your own Association, who has consented to undertake this work, Dr. J. E. Scatterday of Gainesville. I know that both he and I can count on your continued cooperation and good will in this new venture.

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And various issues of *Veterinary Medicine*, and the *Journal of the American Veterinary Medical Association.*

Discussion*

Doctor Sowder, State Health Officer of Florida, has presented an excellent review of the public health activities of veterinarians. He has also told us what our problems are to be in the future—the epidemiological studies of animal diseases communicable to man. The challenge that the encephalitides and rickettsioses offer the public health veterinarian is formidable. The opportunity to discover new facts are everywhere as is also the opportunity to eradicate or control animal diseases that affect the health of man.

Doctor Sowder points out the need for rabies eradication and summarizes the New York Academy of Medicine report. The New York Academy report lists eleven recommendations. The recommendations are as follows with a brief comment on what action is being taken.

1. Efforts should be made to secure uniform national control measures against rabies. The Federal agencies concerned with rabies should draft a national plan for rabies eradication to be recommended to all health, agriculture, livestock, sanitary and conservation authorities.

Comment: Representatives of the Bureau of Animal Industry, Fish and Wildlife Service, and Public Health Service will hold a meeting to draft a rabies eradication policy.

2. Transportation of dogs and other susceptible animals (?) from one state to another by common carrier should be regulated by the Federal Government in cooperation with the state agencies concerned. Permits for entry into a state should be contingent upon vaccination. Effective measures should be devised for the control of interstate transportation by private automobiles or other means not involving common carriers.

Comment: Action taken on this recommendation will depend upon the states' demand for some type of quarantine.

3. Health provisions governing the importation of all dogs and other susceptible animals (?) from foreign countries should be promulgated and administered by the United States Public Health Service.

Comment: The Public Health Service has adopted foreign quarantine regulations which require all animals (?) to be vaccinated against rabies previous to entering the United States unless they are from countries which are free of rabies such as the United Kingdom, Eire, Sweden, Norway, Bermuda, Bahamas, Australia, New Zealand and other Pacific Islands.

4. Rabies in any animal or human being should be made reportable in all states and local units of health jurisdiction, and the figures published in Public Health Reports.

Comment: The Public Health Service is trying to obtain the current figures on the incidence of animal and human rabies and plans have been made to publish them weekly in Public Health Reports when these data are being received regularly from 75% of the states. These figures will be included in the weekly communicable disease telegram reports from the states. At present 16 states are reporting animal rabies in their weekly telegram. States having no rabies during a current week should report "zero."

5. Every state should require annual licensing of dogs. The license fee should be large enough to provide for efficient administration of the law, which requires an adequate force of control officers and veterinarians, as well as funds for vaccine and for the maintenance of pounds.

Comment: This will be incorporated into the national recommendations.

6. Annual vaccination of dogs is recommended, particularly in urban areas. In these areas, the granting of a dog license should be made contingent upon vaccination.

Comment: This will also be a part of the national recommendations.

*By James H. Steele, D.V.M., M.P.H. Chief, Veterinary Public Health Division, U. S. Public Health Service.

7. Until further knowledge concerning immunity against rabies is available the recommendations on vaccination set forth by the National Research Council through its Subcommittee on Rabies in a report issued November 26, 1945, should be generally accepted. These recommendations are based on evidence that a single injection of 5cc of an approved vaccine is effective for use in mass vaccination programs and that three injections of 5cc each, administered a week apart, provide greater immunity and should be advised when practical.

Comment: This will be a part of the national recommendations.

8. Control measures other than registration and vaccination should be emphasized. These include the establishment of quarantine over sufficiently large areas during outbreaks of rabies among dogs, proper disposal of rabid dogs and those suspected of being rabid, destruction or supervised detention for not less than three months of all dogs known to have been bitten by or exposed to rabid animals, and the impounding and disposal of all stray dogs.

Comment: This will be a part of the national recommendations.

9. The United States Public Health Service or the Bureau of Animal Industry or both jointly, should be urged to formulate standard quarantine procedures covering the various situations that arise during an outbreak of rabies and to recommend these to the State and territories for adoption.

Comment: Such quarantine procedures will be formulated by the Bureau of Animal Industry and the Public Health Service.

10. Dog pounds should be available for every unit of local health jurisdiction.

Comment: This will be a part of the national recommendations.

11. An educational program should be launched by appropriate health authorities to explain the necessity for control measures and especially the efficacy of the vaccines now approved by the Bureau of Animal Industry and the National Institute of Health.

Comment: The Public Health Service will provide educational script films, literature, and consultation services on request of government or professional groups.

The paper that Doctor Sowder has presented has described the Florida rabies problem in detail. It is a serious problem and deserves the attention of all veterinarians.

We are all pleased to note the appointment of Dr. J. E. Scatterday as veterinary public health consultant. Doctor Sowder and the Florida State Board of Health are to be congratulated on this progressive step, and to Doctor Scatterday my best wishes for success. The United States Public Health Service will be glad to assist the Florida State Board of Health in developing its Veterinary Public Health Program.

* * * *

The science of healthy functioning—physiology—is the foundation and starting point for the science of morbid functioning—pathology. Except we know the former, we cannot evaluate the symptoms of the latter.

* * * *

Control of Rabies Outbreak

It is a rare occurrence in Maricopa County, Arizona, when a person has to take Pasteur treatment. This is the result of a rabies control program instituted in that health jurisdiction in 1944.

The annual vaccination of all dogs against rabies is believed to be the keystone in the bulwark against the occurrence and spread of rabies among the dogs and other animals in the county and state. Other adjuncts effective in the successful control program are:

1. Funds derived from licensing are utilized to defray expenses of the rabies control program; especially those contingent with the vaccination program.

2. Rigid control of wild predators and unlicensed dogs through use of full-time personnel and cooperation of agencies devoting their time to predator control work.

3. The program is taken to the public. Licensing and vaccination stations are established at convenient locations over the health jurisdiction; thereby, making it easier for pet owners to avail themselves of the vaccination and licensing service. These stations are publicized by every means possible.

4. The closest of cooperation among veterinary medical profession, local department of health, governmental officials and lay groups in promulgating and carrying out a rabies control program is promoted.

Our experience has shown that in the absence of cooperative federal, state, and local control measures, rabies can be controlled at a local level through planning, diligence, perseverance, and effort.

Some 12,000 dogs have been vaccinated each year in Maricopa County since 1944, constituting about two-thirds of the estimated dog population. Cases of rabies in animals have dropped remarkably, since the vaccination program was put into effect. 285 cases occurred in 1944, 55 cases in 1945, 10 cases in 1946, and 13 cases to date in 1947.—PAUL W. MCCRACKEN, M.D., Director, Maricopa Health Unit, Phoenix, Arizona.

Equine Antu Poisoning

By EDWIN J. FRICK, D.V.M.
and JACOB D. FORTENBERRY
Manhattan, Kansas

EVER since World War II large numbers of new rodenticides and other new chemicals have been developed and are now being pushed commercially into channels where they are and, in time, will be even more likely to cause increasingly, new veterinary problems. Specifically we refer to the new rodent control agents like 1080 and antu. They are especially useful during the high price and shortage of foodstuffs but they are definitely toxic and veterinarians should be on guard in spite of non-informed radio sales voices blaring otherwise. The very day we killed horses with as little as 26mg per kilogram of body weight and had two dogs die from eating antu rat bait, the radio announcer told the world, "antu is harmless to domestic livestock."

Of the newer rat poisons, 1080 (sodium fluoracetate) is outstanding but so toxic to all life that only expert handling should be allowed. For detailed report on "Clinical Observation of 1080 Poisoning" see VETERINARY MEDICINE for June, 1946.

Antu (alpha-naphthyl-thiourea) is a decided advance over most former rat poisons. It is a finely granulated, gray powder insoluble in water. It has a high degree of specific toxicity for the Norway rat. It has the disadvantage that sublethal doses tend to develop a high degree of tolerance for the drug, but this tolerance lasts only a few weeks.

Case No. 1.—A gray mare weighing 1250 pounds, 12 years of age and in good condition was given 15gm (26mg per kg. of body weight) of antu rat poisoning. Prior to administration the normal heart rate was 46, respiratory rate was 16 and temperature of 99.5° F.

The antu was administered in a 2-ounce capsule *per os* at 4:00 p.m. She was checked hourly, following administration of the antu, and no symptoms developed until 9:00 p.m. At this time the heart rate and respiratory rate started to increase. The temperature remained normal. There was a white, frothy discharge noticed flowing from both nostrils and the mouth.

At 10:00 p.m. the heart rate was 93 and the respiratory rate 62; temperature still normal. The discharge was showing a bloody tinge. The mare died about midnight.

Post-mortem findings: The lungs would not collapse because they were distended with fluid. The surface vessels were well marked around the border. The lower half of both lungs were congested and edematous. The pleural cavities contained approximately two liters of clear fluid.

Stomach: The fundic portion was intensely hemorrhagic.

Heart: There was a marked hemorrhagic reddening of at least one-half of the endocardial surface of the left ventricle. The hemorrhage did not seem to extend into the muscle but was just beneath the endocardium.

Kidneys: They appeared softened.

Some of the muscle meat and liver was fed to dogs and cats, but no ill effects resulted.

Case No. 2.—November 28, 1947, a black mare, weighing 850 pounds, was given 11mg of antu per kg. of body weight. No symptoms developed.

December 1st, the same mare was given 15mg per kg. of body weight. Still no symptoms.

Again on December 4th, the same mare was

given 23mg/kg. without observable harm.

December 7th, she was given 30mg per kg. of body weight. This was 4mg per kg. more than it took to kill the gray mare in the previous experiment. This leads us to believe that a tolerance to antu was being built up. No symptoms were observed.

December 10th, 40mg/kg. were given. A slight increase in heart rate and respiratory rate was observed. Some sweating also was observed over the entire body. The mare seemed to be slightly depressed.

December 13th, 60mg/kg. were given. The same symptoms were noted as on the 10th, but

were more pronounced. These symptoms were observed seven to eight hours subsequent to giving the antu.

December 16th, 80mg/kg were given at 2:00 p.m. Symptoms appeared around 10:00 p.m. Increased heart and respiratory rates, profuse sweating and depression were evident. Death resulted about midnight. About an hour prior to death a profuse, frothy discharge was flowing from both nostrils. This was white with a slightly blood tinged appearance. This seems to be the most characteristic symptom of antu poisoning (see illustration).

Post-mortem findings: About two liters of clear fluid was present in the pleural cavity, together with congestion and edema of the lungs, and catarrhal gastroenteritis. These findings are the same as were observed in the other animal poisoned with antu (Case No. 1).

This would indicate that when given non-lethal doses, horses, like rats, can build up a tolerance for antu.

* * * *

Famous American Horses

Justin Morgan

Justin Morgan, a famous early American horse whose descendants helped win three major wars and countless Indian Battles was foaled in 1789 at Springfield, Massachusetts, and was moved to Vermont where he was to make his reputation when he was four coming five. His breeding, although the subject of much debate, has been pretty clearly established as thorobred tracing strongly on both sides to the three famous foundation English sires, Byerly Turk, Godolphin Barb, and The Darley Arabian. These three stallions, all of Arabian or Barb blood, are considered to be the fountain head of the English thorobred breed. The close intermingling of this famous Arabian blood in Justin Morgan's background may explain the various similarities between Justin Morgan and all his get, with what we know today as the Arabian horse.

The outstanding feature of this big little horse is that he transmitted his greatness to his offspring and they in turn carried this quality on further. His size, by the standards of his time or the present, was small, even though he weighed 950 pounds, his height was but 14 hands—a mere pony. His all-around versatility won him fame. His get had the endurance and ability to work in harness clearing the land, to pull lighter vehicles on the roads, and to be ridden long journeys on short rations. This latter quality also made them sought for as army mounts. Added to all this, a most agreeable disposition and tractable nature, combined with the fire and spirit of a charger and an inherent natural beauty, captivated the hearts of all horsemen.

Mention of this horse, no matter how brief, would not be complete without reference to the fable concerning his log-pulling feat in which he pulled an extremely large log ten rods in two stages, a prodigious task according to the legend. Horses outweighing Justin Morgan by 300 pounds had previously failed to move the timber. An embellishment to this tale is that when the owner of Justin Morgan saw the log the other horses had failed to move, as a further handicap to his horse, he agreed to permit three of the loafers present to ride the log and the little horse pulled log and three passengers up to the mill. This tale, whether true or not, indicates the great admiration the early horsemen had for this animal and another ingrained characteristic of horsemen, *i.e., never* to let the truth spoil an otherwise good story.

Justin Morgan has been reported as being able to walk six miles in an hour, was seldom beaten in quarter-mile running races, even by the champions, and his ability as a draft animal is history. During the period of development of the eastern United States agriculturally, there was an acute need for a small, utility animal to work on the hill farms and also to pull a buggy over the roads that were being built after the revolution. At the same time the trotting sport was becoming a craze. Many of Justin Morgan's versatile descendants became noted performers in this field; one, Ethan Allen, being World Champion Trotting Stallion. Other offspring of Justin Morgan figure prominently in the pedigrees of the American Saddle Horse. The Morgans were by far the first choice of liverymen as late as the 1890's. Their endurance and fine dispositions made them ideal rental horses.

After having been sold from owner to owner and having been given the poorest of care, this great progenitor of a breed of horses died following a kick from another horse in 1821 at the age of 32. His true greatness not to be recognized for years to come. The decline of this great breed of horses can be explained by one word—specialization. The Hambletonians, an off-shoot of the Morgan breed, could out trot them; the American saddle horses, another off-shoot was an improvement in that special field, and the thorobred could outrun the Morgan. As agriculture moved westward into fields that were larger and less steep a heavier draft horse was needed. This left no place for the great utility horse of the nineteenth century. In his favor it must be said that it took four breeds to lick him.—ISAAC E. HAYES, Waterloo, Ia.

Studies of Bovine Mastitis VI.

Penicillin Therapy in Chronic Staphylococcic Mastitis

By H. J. HARDENBROOK,* D.V.M., M.S.
H. S. BRYAN,* D.V.M.
and L. E. BOLEY,* D.V.M., M.S.

DISCOVERY of the inhibitory action of penicillin on bacteria by Fleming[1] in 1929 and subsequent studies by other research workers has provided the veterinarian with a drug that may be of considerable value in a bovine mastitis control program. Results of studies reported since 1944 suggest that penicillin can free the udder of many disease-producing organisms capable of causing mastitis; however, the results seem to vary with the physical condition of the udder and the species of organism present.

In 1944 Kakavas[2] reported that four of seven quarters chronically infected with staphylococci were cured when 1200 to 15,000 Oxford units of penicillin were administered one to seven times at 24-hour intervals. Klein, Crisman and Moor[3] (1945) treated seven quarters of five cows infected with pathogenic staphylococci. Four to eight infusions of 22,800 units of penicillin sodium were made at 6 to 12-hour intervals. While the organisms disappeared from the milk during treatment, only one of the seven quarters was apparently permanently freed of staphylococci. Slanetz and Allen[4] (1945) used single doses of 100,000 to 200,000 Oxford units of penicillin in 100cc of distilled water to infuse 14 quarters infected with hemolytic staphylococci. Eleven quarters (75%) were cleared of infection as judged by bacteriological examination of the milk, although the 200,000-unit dosage was usually required to bring about recovery.

Johnson and Fincher[5] (1946) used penicillin therapy in 316 acutely and chronically affected quarters of 213 cows. Fifty-one of the quarters were infected with staphylococci. Staphylococcus-infected quarters with no more than distinct fibrosis responded to single infusions of 40,000 units or less. Their conclusions indicated that all infected herds studied were benefited by penicillin therapy, although the results were far from perfect due to the use of incorrect dosages, infrequency of infusion and severity of the disease in treated animals.

Data relative to the probable optimum dosage and average dosage level required for treatment of chronic staphylococcic mastitis are presented in this paper. Preliminary data comparing penicillin calcium in light-weight mineral oil and penicillin sodium in normal saline solution in the treatment of lactating quarters are also included.

Procedure.—The cows used for this study were in three privately owned, machine-milked herds containing 49 milking cows. Owners of two of the three herds reported that there had been a steady deterioration in the quality of the milk and a gradual increase in the incidence of both acute and chronic mastitis.

In one herd the cows were prepared before milking by washing the udder and teats with warm chlorinated water. In the second herd only the teats and udders of cows showing gross contamination were washed with warm chlorinated water prior to milking. The teats and udders of the cattle in the third herd were not washed, but any clumps of material on the teats which might interfere with milking were removed by hand. In all three herds the teat cups of the milking machines were dipped in chlorinated water between cows. Additional systematic mastitis control measures were not employed in any of the three herds. An unknown number of cows in one herd had previously been treated for chronic mastitis with single doses of 50,000 to 100,000 Oxford units of penicillin sodium without preventing the appearance of additional cases. At the time each herd was selected for experimental treatment, an agreement was made with the owner that cows infected with organisms capable of producing mastitis would be treated irrespective of the stage of lactation or the duration of the infection. All infected quarters were treated in conformity with the agreements except for 16 staphylococcus infected quarters (controls).

Diagnosis was based upon examination of quarter milk samples taken two or more times at weekly intervals prior to treatment. Examinations were made by the microscopic test described by Bryan, Moore and Campbell[6] (1940) and by plating on Edwards' medium and on 5% equine blood-agar plates. No quar-

*From the Department of Veterinary Pathology and Hygiene and Clinical Veterinary Medicine College of Veterinary Medicine and the Agricultural Experiment Station, University of Illinois, Urbana, Ill.

ter was selected for treatment unless repeated examinations of milk samples were positive for staphylococci prior to treatment.

Quarters were examined clinically for evidence of fibrosis immediately after milking and were divided into three groups: (1) quarters in which no fibrosis was detected; (2) quarters in which slight fibrosis was present; (3) quarters in which marked or extensive fibrosis with or without atrophy was present (Table I).

Sterile normal saline solution was used as solvent for the penicillin sodium. The solvent was added to the powdered commercial penicillin immediately preceding injection. All quarters were treated with either 50 or 100cc of the penicillin solution. Penicillin calcium (commercial preparation), in light weight mineral oil, was infused into the quarters of four groups of cows (Table I) by means of a sterile, 50cc, glass syringe with a flexible rubber nozzle and a sterile teat cannula. Infusions were made immediately after milking, and treated quarters were massaged thereafter for one to two minutes.

During the course of this experiment 102 quarters of 30 cows infected with staphylococci each received one to three infusions of either the calcium or sodium salt of penicillin (Table I). Post-treatment quarter samples of milk were collected each week for a minimum of four weeks to determine the effectiveness of the dosage level and the preparation used. Treated quarters were considered cured if the bacteriological results continued negative through the fourth post-treatment week.

Results.—Table I gives the results observed one month after treatment and illustrates the relation of fibrosis to the results of treatment.

Twenty-nine (54%) of 54 chronically infected quarters without detectable fibrosis, responded to treatment, while five (21%) of 24 of those quarters with slight fibrosis and five (21%) of 24 infected quarters with marked or extensive fibrosis responded to treatment. The results of treatment seem to indicate that the proportion of quarters freed of infection was consistently greater following treatment with penicillin calcium in light weight mineral oil than with penicillin sodium in normal saline. A comparison of the results obtained in groups two to five, inclusive, indicates that 20 (45%) of 44 chronically infected quarters treated with penicillin calcium in light weight mineral oil were cleared of infection, while only six (16%) of the 37 quarters chronically infected with staphylococci were freed of infection by treatment with penicillin sodium in normal saline. The 16 infected quarters of nine cows composing group 7 (Table I) received no treatment and were still bacteriologically positive for staphylococci at the termination of this study.

In one experimental herd nine quarters infected with both staphylococci and streptococci were treated with three udder infusions of 50,000 units of penicillin each at 24-hour intervals (Table II). Four laboratory examinations of milk samples at weekly intervals after treatment revealed that one quarter was freed of staphylococci and eight quarters were freed of streptococci. One quarter (11%) remained free of both organisms at the end of one month.

Discussion.—Data obtained in this limited

TABLE I.—SUMMARY OF RESULTS OBTAINED AFTER UDDER INFUSION OF PENICILLIN SALTS IN CHRONIC STAPHYLOCOCCIC MASTITIS

Group	Interval Between Infusions Hours	Amount Infused		Quarters Without Fibrosis		Quarters Slight Fibrosis		Quarters Marked or Extensive Fibrosis		Total Number Quarters		Per Cent Cured
		Penicillin Na. Units**	Penicillin Ca. Units***	Treated	Cured	Treated	Cured	Treated	Cured	Treated	Cured	
1*	1 infusion only	300,000		2	0	1	1	3	0	6	1	17
2a	12	100,000		3	1	4	0	5	1	12	2	17
2b	12		100,000	10	6	2	0	0	0	12	6	50
3a	24	50,000		5	0	2	0	2	0	9	0	0
3b	24		50,000	10	3	3	0	6	1	19	4	19
4a	24	100,000		4	2	3	0	1	0	8	2	25
4b	24		100,000	3	2	2	1	2	1	7	4	56
5a	48	100,000		2	0	4	1	2	0	8	1	12
5b	48		100,000	6	6	0	0	0	0	6	6	100
6	48	200,000		9	9	3	2	3	2	15	13	87
TOTALS				54	29 (54%)	24	5 (21%)	24	5 (21%)	102	39	
7—Untreated Controls				12		3		1		16		

*With the exception of group 1 all groups received 3 consecutive infusions at the stated time interval.
**Penicillin sodium refers to a solution in either 50 cc. or 100 cc. of 0.85 per cent sodium chloride.
***Penicillin calcium refers to a suspension in either 50 cc. or 100 cc. of light weight mineral oil (Abbott).

study indicate that successful treatment of quarters chronically infected with staphylococcic mastitis is dependent upon the maintenance of an adequate dosage level. An appreciable number of quarters failed to be cleared of staphylococcic infection when 50,000 Oxford units of penicillin were used, although this dosage level is apparently adequate for the elimination of the majority of the chronic infections due to streptococci. Strain variation in resistance to penicillin of the organisms infecting the three herds, apparently, was not marked, for comparable results were obtained irrespective of ownership of cows when the dosage level was 100,000 Oxford units or more per quarter.

Under the treatment plan followed in this study there was little evidence of development of penicillin-fastness, although Lyons[7] (1943) reported that staphylococci may develop strains resistant to penicillin. Symptoms of systemic toxicity due to penicillin salts were not observed, following the infusion of a single 600,000 Oxford unit dose into the udder of one cow, although local post-treatment reactions occurred in two cows as evidenced by a temporary drop in milk production and a slight transient flakiness of the milk.

Any detectable fibrosis apparently decreases the chances of successfully freeing the udder of staphylococcic infection; however, the degree of fibrosis is apparently of little importance, for comparable results were obtained in quarters with either slight or extensive fibrosis.

In the series of treatments reported herein, observations suggested that there was no correlation between the stage of lactation and the effectiveness of penicillin treatments in clearing infected quarters. In addition, it was observed that quarters producing markedly abnormal milk were seldom freed of infection by a series of three infusions even though the microscopic appearance of the milk from most quarters improved to such an extent that it seemed to be normal.

The efficacy of penicillin therapy in treating chronic staphylococcic mastitis is less than that reported for chronic streptococcic mastitis. However, results of this study indicate that repeated treatment with 100,000 to 200,000 Oxford units of penicillin freed a significant proportion of quarters chronically infected with staphylococci.

TABLE II.—EXPERIMENTAL PENICILLIN THERAPY IN QUARTERS CHRONICALLY INFECTED WITH STAPHYLOCOCCI AND STREPTOCOCCI

Cow No.	Infected Quarter No.	Clinical Condition of Quarter	Treatment Total Units	Treatment Vehicle	Quarters Cured at 30 Days Staph.	Quarters Cured at 30 Days Strep.
1	2	M. dif. fib.	150,000	Oil	NC	C
2	2	S. dif. fib.	150,000	Oil	NC	C
2	3	M. dif. fib.	150,000	Oil	NC	C
11	2	Ext. dif. fib.	150,000	Oil	NC	C
15	2	N	150,000	Oil	NC	C
19	4	N	150,000	Oil	NC	C
20	3	N	150,000	Oil	NC	NC
6	1	Hp—N	150,000	Saline	NC	C
12	4	N	150,000	Saline	C	C
Number and percentage cured					1(11%)	8(89%)

KEY: 1=R. F. quarter
2=R. R. quarter
3=L. R. quarter
4=L. F. quarter
NC=not cured
C=cured

Oil=penicillin calcium in light weight mineral oil
Saline=penicillin sodium in normal saline
Ext. dif. fib.=extensive diffuse fibrosis
M. dif. fib.=marked diffuse fibrosis
S. dif. fib.=slight diffuse fibrosis
N—=normal consistency
Hp=physiological swelling

Summary.—1. One-hundred-two quarters of 30 cows chronically infected with staphylococci were treated with one to three infusions of penicillin.

2. Fibrosis in varying degrees appeared to diminish greatly the effectiveness of penicillin, since 10 (21%) of 48 quarters with slight to extensive fibrosis became negative for staphylococci while 29 (54%) of 54 infected quarters, without detectable fibrosis, became negative following infusion with penicillin.

3. Penicillin calcium in light weight, mineral oil gave consistently better results than penicillin sodium in normal saline as judged by bacteriological findings after treatment.

4. Seven quarters of six cows infected with both streptococci and staphylococci were treated with three consecutive daily infusions of 50,000 Oxford units of penicillin calcium in light weight mineral oil, and two quarters of two cows were treated with 50,000 Oxford units of penicillin sodium in normal saline solu-

tion. Only one quarter (11%) became bacteriologically negative for staphylococci, although eight of the nine quarters became bacteriologically negative for streptococci following treatment.

Acknowledgement.—The authors wish to express their appreciation to Abbott Laboratories for providing the standardized solutions of penicillin calcium in light weight mineral oil.

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Bovine Leptospirosis

In August, 1947, an outbreak of leptospirosis was diagnosed in a herd of 20 Hereford cows in central Illinois. Three animals died and one recovered after penicillin treatment. In addition, one animal had died early in July following a chronic illness which may well have been leptospirosis.

Bovine leptospirosis was reported in Russia in 1935, Palestine in 1941 and Australia in 1943. In the United States the disease has been reported more recently in New Jersey (1944), Montana (1945) and Texas (1946). It may be more common than was previously suspected.

The *cause* of bovine leptospirosis is a bacterium of the genus Leptospira which is apparently distinct from *L. icterohaemorrhagiae* and *L. canicola*.

The *incubation period* is usually eight to ten days, but varies from four to 13 days.

Symptoms include fever (104°-107° F.) with rapid respiration and anorexia, nasal discharge (at first mucous and later mucopurulent), anemia, jaundice and hemoglobinuria. In fatal cases death occurs in 48 to 72 hours. Many animals either recover quickly after the initial attack or remain unthrifty for weeks. Chronic cases with persistent diarrhea and occasional hemoglobinuria also occur. Up to 40% of a herd may be affected, but mortality is usually less than 10%. Abortion may occur as the only symptom, or it may follow a mild or severe febrile attack. In some outbreaks abortion may be the greatest cause of economic loss.

Post-Mortem Findings.—In acute cases the carcass is jaundiced, the blood is visibly anemic and the bladder contains dark brown or reddish urine. The liver is yellowish and may show necrotic foci and petechiae. The kidneys may be pale and flecked with deposits of blood pigment. Chronic cases show interstitial nephritis, ulceration of the mucosa of the abomasum and small granulations on the costal pleura and perhaps on other serous surfaces.

Diagnosis.—The clinical picture of fever with icterus, anemia and hemoglobinuria is rather characteristic, but differentiation from hematuria, bacillary hemoglobinuria, pyelonephritis, cystitis and post-parturient hemoglobinuria is necessary. Leptospirosis bears some resemblance to anaplasmosis, but in the latter hemoglobinuria is rare.

Laboratory diagnosis is made by demonstrating Leptospira in tissues or cultures or in experimental animals (calves and guinea pigs). For these examinations the following specimens may be submitted: (1) thin smears of blood serum, (2) thin slices (approximately 1 to 2mm thick) of liver, kidney and spleen fixed in 10% formalin or (3) kidney, liver, spleen and urine collected aseptically and brought or sent under refrigeration and without delay. Leptospirae are delicate organisms, and exact technique is necessary in order to demonstrate them by any of the above-mentioned methods; hence care must be taken in selecting and submitting specimens. For this reason, too, negative laboratory findings do not exclude the possibility of infection.

Prevention and Treatment.—Accurate data on therapy are lacking, but uncontrolled observations from Texas suggest that sulfanilamide may be beneficial in the febrile stage. Affected animals may eliminate Leptospirae in the urine for several weeks; hence isolation of sick and recovered animals is desirable.

Transmission to Man.—The species of Leptospira infecting cattle in the U.S.A. has not been determined, but overseas work shows that species which infect cattle also infect man.—***Veterinary Pathology & Hygiene Extension, University of Illinois.***

Amino Acids in Animal Nutrition

By F. D. EGAN, D.V.M.
Farmington, Michigan

THE essential nature of protein has long been known, yet it has been only within recent years that protein deficiency has been fully recognized as an important factor responsible for much of the mortality and morbidity of many medical and surgical cases. The amino acids preparations, made available comparatively recently, have provided life-saving therapy for protein deficiency states and have focused attention on the common incidence of protein deficiency in disease of man and animals and its serious prognostic significance.[1,2,3,4]

Important advances, too, have been made in our knowledge of the nutritional requirements for individual amino acids, the building blocks of protein, by different animals. This knowledge promises to exceed, and in any case, to equal, in practical importance the knowledge of the animal's requirements for individual minerals and vitamins. A prerequisite to utilization of this newer knowledge of amino acids requirements is a knowledge of the quantitative amino acids content of the proteins commonly used as feed for the animal. Complete data, particularly for the latter, are lacking, and some of the older data on amino acids content of proteins are not reliable.[5] Nevertheless, the information now available is adequate to enable the veterinarian to guide his clients in providing a better nutritional ration from the standpoint of the vitally important amino acids requirements, as well as from the better-known vitamin and mineral requirements. This application of amino acids is a very recent development, and is the subject of this paper.

The fortification of the dog's diet with essential amino acids to procure more complete utilization of the protein fed may well point the way to providing similar protein enrichment of the human diet in those countries in which much of the protein consumed is of inferior quality (deficient in one or more of the essential amino acids).

Proteins in Nutrition

The necessity for providing an adequate quantity of protein in the diet of animals and humans is well-recognized. Not much recognition is accorded the fact that "protein" is a generic term used to designate a class of foodstuffs which differ widely from one another in nutritional value. The nutritional value of a protein is dependent upon its content of essential amino acids and on the availability of these amino acids to the organism (the digestibility of the protein). Unless qualified or defined, a statement of the percentage of protein in a ration is of dubious informational value.

In human nutrition, this comparative lack of distinction of the differences in value among proteins, arises from the fact that the proteins in the human dietary in this country are largely comprised of the high quality proteins: the most digestible cuts of meat; milk, eggs, fish, poultry, etc. Each of these has a high co-efficient of digestibility and each has a high content of all of the essential amino acids.

These proteins are our most expensive foods. Necessarily, the cheaper proteins must furnish the dog with the major part of his protein requirements. Such proteins are inferior in respect to content of essential amino acids and many have a low co-efficient of digestibility. The essential amino acid content of the dog's ration is, therefore, often at critically low levels, and under certain conditions reveals itself as frankly inadequate for requirements. Before discussing this in more detail it is pertinent to present data on the effects of variation in content of the individual amino acids in the ration of the experimental animal.

Deficiency of an Essential Amino Acid

An essential amino acid is now defined as "one which cannot be synthesized by the animal organism, out of the materials ordinarily available at a speed commensurate with the demands for normal growth."[6] The following are classified as essential (or indispensable): lysine, tryptophane, histidine, phenylanaline, leucine, isoleucine, threonine, methionine, valine and arginine. The absence of any one of these* from the ration of a growing animal results in a loss of appetite and weight, lessened resistance to infection and ultimately, death.

A relative deficiency of any one of the essential amino acids in the ration of an adult or young dog may cause difficulties of digestion and elimination, skin and coat disorders, nervousness, poor, capricious or aberrant appetite, retarded growth, interference with reproductive functions, low degree of resistance to infection, laziness, and premature aging.

Deficiency of certain of the essential amino acids has been reported to cause unique symptoms and effects:

*Except arginine, which can be synthesized by the organism but not at a sufficiently rapid rate for normal growth. Arginine is not essential for nitrogen balance in the adult dog.

Valine—sensitivity to touch; severe lack of co-ordination of movement.[7]

Tryptophane — cataract formation, alopecia.[8,9]

Arginine—atrophy of spermatogenic tissue.[10]

Lysine—nausea, dizziness, hypersensitivity to sound.[11]

Barking, or hysterical fits in dogs has been associated with feeding of rations high in wheat flour. The deficiency of wheat in lysine is suggestive of a lysine deficiency in this disorder. In kennels, hysteria is first observed in the fast growing immature dogs and nursing bitches. Mature dogs are more immune. A year ago Sir Edward Mellanby[11a] reported the occurrence of convulsions in a group of experimental dogs when fed on bread made from "agenized" flour—wheat flour bleached with nitrogen trichloride—and recovery of the dogs when put on a diet of unbleached flour. Since then there has been a great deal of speculation in the medical press of this country as to possible effects of bleached flour on persons. Since practically all flour used in this country for many years has been bleached by the agene process, we can surmise the danger to humans is not of an emergency nature. Mellanby does not give the symptoms that agenized flour produced in his dogs, except to say they had convulsions. Until more details are published all that can be said is, dogs fed on bread made from bleached flour had convulsions. Mellanby called the condition hysteria or fright disease, but that diagnosis lacks support and seems of doubtful accuracy. Whether the convulsions were due to a deficiency or to a toxic substance is unknown as yet.

Protein Metabolism

The work of the late Schoenheimer of Harvard, who conducted ingenious experiments with tagged nitrogen, has conclusively demonstrated that none of the cells of the body are permanent; that there is a continuous breakdown of the protoplasms of the cells of all tissues. The rate of breakdown varies—the liver cells, on the one hand, break down rapidly; by contrast, the brain and nerve tissue break down very slowly. But none of the tissues are static. "Even the tendons of a rabbit, the proteins of which may be considered to have a purely structural function, reveal a slow, but significant activity."[12] Schoenheimer's studies, amply confirmed by Luck,[13] Madden and Whipple and many others, proved, too, that protein is never stored as glycogen and fat are stored, but is always an integral part of the functioning protoplasm.

This breakdown of protein of the tissues is counter-balanced by synthesis of protein if material is available with which to build. If one of the ten essential amino acids is lacking the rebuilding cannot take place. The effect of a diet lacking one of the essential amino acids is much the same as if no protein at all were fed, and the other amino acids being inadequate for building tissue, are deaminated by the liver and the nitrogen is eliminated in the urine as excess urea.

A comparative deficiency of one of the amino acids limits the rebuilding to the extent that particular amino acid is deficient, and the wastage of the other amino acids is commensurate with its relative deficiency.

In other words a protein which is entirely lacking in one (or more) of the essential amino acids is incapable of supporting growth and life. One which is deficient in one of the amino acids has to be fed in large quantities in order to supply the minimum requirement of each deficient essential amino acid. The former is an "incomplete protein"—zein of corn and gelatin are examples. The latter are proteins of "poor biological value"—gliadin of wheat is an example. Gliadin contains only 0.7% of lysine,[15] the minimum requirement for lysine has been reported as 1% of the total ration.[16] Thus, if the animal were fed a 100% protein diet it would not suffice for his protein needs if all of the protein was in the form of gliadin.

Amino Acids Supplementation

An incomplete protein may be made a complete protein of high biologic value by adding to it in adequate amounts the amino acids in which it is deficient. A protein of low biologic value may be made of high biologic value by similar supplementation. When zein, the protein of corn, is fed to an animal as the sole source of protein in a diet adequate in all other respects, there follows a decline in weight, nutritional deficiency lesions and eventually death—usually as a result of a terminal infection. The addition of comparatively small amounts of tryptophane and lysine to the same diet makes it completely adequate for growth, health and reproduction.[5]

In a recent experimental study[17] pigs were fed a diet of 87% corn, 5.5% casein, 5.5% soybean oil mixture and supplements of minerals and vitamins (except niacin). Severe diarrhea developed in the fourth week. The hair appeared rough and the skin around the ears was scaly. Autopsy revealed extensive lesions in the large intestine, but no pathogenic bac-

teria could be isolated. Another group on the same diet supplemented with only 7mg of tryptophane per pound of body-weight were thrifty and sleek, and presented no lesions. They gained weight more efficiently than a group receiving a niacin supplement and an extra quantity of protein in the ration. (One pound gain for every 2.29 pounds of feed.)

Casein, a milk protein, is generally conceded to be a protein of fairly high quality. As the sole source of protein in the diet, nitrogen balance can be achieved with casein fed at comparatively low levels. Yet, the addition of only 95mg of methionine (for a dog weighing 22 pounds) to casein permits a 37% reduction of the casein without affecting nitrogen adequacy of the ration.[18]

The efficiency of gliadin may be increased many-fold by the addition of a small amount of lysine. Much other similar data could be presented which demonstrate that the efficiency, *i.e.*, the utilization of the protein of many rations may be greatly enhanced in value by the addition of the amino acids in which the ration is comparatively low.

Amino Acids Content of Dog Rations

"Most of the vegetable and cereal proteins appear to be deficient in one or more of the essential amino acids. . . . Cereal proteins in general contain considerably less lysine and tryptophane than do animal proteins."[19] Meat may or may not be an essential food for the dog—but of certainty the amino acids which meat supplies are essential to compensate for the deficiency of the cereal and vegetable proteins. Moreover, the meat should not contain too large a portion of skin, tendon and other "tough" material. Even if finely ground (meat meal) the protein component (collagens) of such tough portions is resistant to peptic and tryptic digestion, and much of that ingested may be excreted in the feces.[15] If boiled with water, collagens yield a readily digested protein—gelatin—but gelatin is completely lacking in tryptophane and valine and low in content of certain other essential amino acids.[15]

In the manufacture of commercial dog foods, canned or dry, two objectives must be met: an adequate ration and a reasonable price. The manufacturers of the better rations conduct feeding tests which prove the adequacy of their ration, under the conditions of the testing. Under other conditions the ration may require adjustment by the veterinarian. It is more economical for the veterinarian to adjust the ration to the needs of the individual than for the manufacturer to attempt to provide a ration which would meet all requirements. Such a ration would not be efficient because it would supply more of the costly essentials than some dogs require, and this would necessarily be reflected in the cost of the ration.

Indications for Adjustment

Many growing animals, pregnant and nursing females require more minerals and vitamins than are provided in the basic ration. Providing supplements for this purpose is common and sound practice. The protein requirement in these periods is similarly increased. The National Research Council's recommended daily allowance of protein in pregnancy and lactation, is approximately 50% higher than that of other adult females. During periods of rapid growth, the protein recommendation (per pound of body-weight) is two to three times that of adults.[20]

Instead of increasing the protein content of the ration, the efficiency of the protein may be increased by supplementing it with essential amino acids. The utilization of the cereal and meat-scrap proteins can be greatly increased in this manner and this is equivalent to providing additional protein. It is a much less costly and also a more efficient method since it entails less work for the kidneys.

The development of pure amino acids and concentrate sources for all the essential amino acids has made it an inexpensive and practical procedure. We have employed nutri-aminoze,* the first and at this time, the only product of this kind available, as far as the writer knows, with very gratifying results. In puppies, pregnant and nursing females this product supplies all of the essential amino acids in amounts which secure more complete utilization of the protein of the dog's basic ration and, in addition, supplies all of the essential minerals and vitamins in adequate amounts. It is economical for the client and profitable for the veterinarian.

The Overfed Dog

The protein requirement (and that of other essentials) of adult dogs is directly proportional to the body surface area and the weight. Adult dogs of the same weight have practically identical requirements for these essentials. The caloric requirement, however, parallels activity. A dog permitted unlimited range may require over 60% more calories than a confined dog. No one ration, therefore, can efficiently meet the varied needs occasioned by differences in exercise permitted. The following table is an adaptation of Dechambre's table as cited by Linton.[21]

*Supplied by Seward Veterinary Pharmaceuticals, Highland Park, Mich.

ENERGY REQUIREMENTS OF DOGS OF DIFFERENT WEIGHTS FOR MAINTENANCE, MODERATE ACTIVITY, AND GREAT ACTIVITY

Weight of dog		Total calories for—		
Kilograms	Pounds	Maintenance	Moderate activity	Great activity
		Calories	Calories	Calories
5	11	520	680	860
10	22	855	1,140	1,440
15	33	1,080	1,360	1,680
20	44	1,265	1,665	2,120
27	59.4	1,550	2,060	2,620
40	88	2,020	2,670	3,400
50	110	2,230	3,085	3,930
60	132	2,640	3,490	4,450

A 22-pound kennel dog allowed moderate activity requires approximately 1140 calories daily. If the ration were an efficient one, *i.e.*, economical, it would not contain a great excess of the relatively expensive protein and would probably just meet minimum requirements for some of the essential amino acids, minerals and vitamins.

Kade found 50 calories per kilogram of body-weight, with an adequate nitrogen intake, to be sufficient calories to secure nitrogen balance in adult laboratory dogs.[18]

A city dog of the same weight but permitted very limited activity would require only approximately 855 calories. The same ration which was an adequate ration for the kennel dog would be inadequate for this one. An effort to obtain his requirements of the essentials from this ration may lead to over-eating. The excess calories would be stored as fat and the dog would become obese, listless and develop difficulties of digestion and elimination. Dogs of this description are commonly seen in small animal practice in urban areas. In their propensity to become "garbage hounds" these dogs may be exhibiting canine wisdom searching for a better-balanced ration.

Conclusions

Supplementation of the basic ration with amino acids (nutri-aminose) together with definite instructions on the amount of food (calories) to be fed, appears to be remarkably effective in assuring a full, glossy coat, clear skin and eyes, restoration of normal body-weight, alertness and playfulness which almost invariably follow when an adequate well-balanced ration is fed. Such a ration, on the basis of experimental evidence, can be expected to delay aging symptoms and contribute to longevity of the animal.

The sale of dog foods has been taken over by the grocery and drug store. No one ration can meet all requirements efficiently. Adjustment of the basic ration to meet the individual requirements of the animal is properly in the province of the veterinarian and none other. The recent advances in our knowledge of amino acids requirements and the development of a product making it convenient for us to apply this knowledge in a practical way now makes complete supplementation possible and greatly enlarges the scope of participation of the veterinarian in this aspect of dog care.

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Veterinary Problems in Poultry Production

By W. R. HINSHAW, D.V.M., Ph.D., Davis, California

Test Pox Vaccine before Using

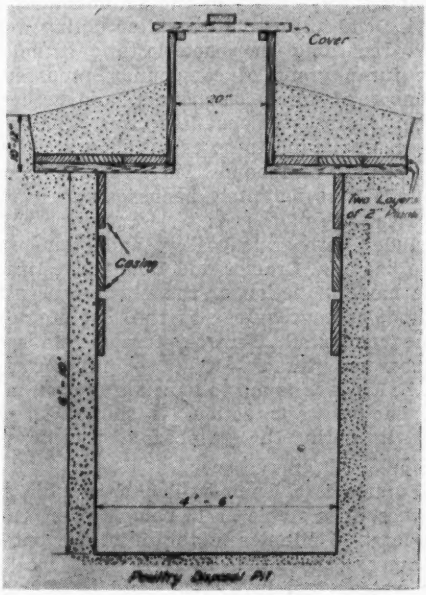
Recently a turkey grower telephoned to me for advice concerning the procedure to follow when fowl pox vaccine fails to produce "takes." Ten days previously he had vaccinated his 37,000 turkeys and on examining for "takes" had discovered that none of the birds showed reactions. Subsequent studies made on the vaccine showed that it had lost its viability so the flock had to be revaccinated. The experience could have been avoided had his veterinarian tested the vaccine for potency on a sample group of 25 to 30 turkeys, a week previous to the time of vaccination of the flock. It is not often that nonviable fowl pox vaccines are encountered but losses from their use can be prevented by occasional potency checks of each lot purchased. If a vaccine has to be kept for any length of time it is advisable to determine its potency by vaccination of a few susceptible birds before it is dispensed.

Poultry Disposal Pit Improves Farm Sanitation

Proper disposal of dead birds on a poultry farm is an essential in disease prevention. Some methods help to disseminate disease more than to prevent it. Shallow burying, or throwing birds on isolated fields, or into streams are examples that should not be followed. Feeding dead, uncooked birds to swine is a dangerous procedure, because some diseases, *e.g.*, tuberculosis and salmonellosis, may be transmitted to the swine. Furthermore, the swine may in turn transmit these diseases to other birds. Another reason for not feeding unsterilized dead birds to swine, is that the uneaten portions of the carcasses may be consumed by wild birds, rats, cats, or dogs, and these animals in turn, carry infection to poultry ranches.

Misuse of incinerators make their employment questionable on most farms. Too many poultrymen pile their dead birds outside the incinerator until it is convenient to burn them. In the meantime, flies, rats, birds and other animals may do a good job of spreading disease to a neighboring flock.

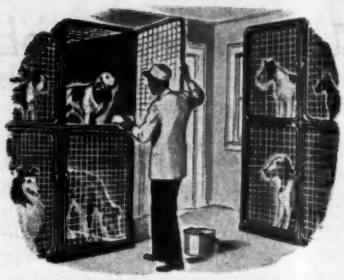
A method which is growing in popularity is the use of a disposal pit such as shown in the accompanying illustration. Its simplicity and ease of operation, plus its effectiveness, explain its popularity. Such a pit can be located near the poultry buildings, and if properly constructed will not be at all objectionable. It should be located on an area which drains away from the water supply. The size depends on the needs of the flock owner. The usual procedure is to make the pit about six feet deep and four to six feet wide. It is important to have the top well covered and air tight.



The size of the opening at the top depends on the use. On a chicken farm there is not the need for as large an opening as on a turkey farm. For turkeys it is desirable to have an 18 or 20 inch opening. The lid for the opening must be tight fitting and fly proof.

One of the principal advantages of this disposal method is the ease with which the dead birds can be discarded. All one has to do is to remove the lid and drop the carcasses into the pit. A small amount of caustic lime spread over the birds occasionally will hasten decay. The pit may be used for incubator eggs and waste, but since eggs do not decay, such use shortens the life of a pit. The liberal use of DDT on the surface is advisable as a fly control measure, but if the pit is properly constructed and used, fly control will not be a problem.

The Treatment of Superficial Infections of Small Animals with a New Bacterial Agent



By ALVIN D. KAPLAN, B.A., D.V.M.
Arlington, Massachusetts

INCREASED research for other effective chemotherapeutic agents was evident following the discovery of the sulfonamides. In 1944, Dodd and Stillman,[1] after noting a report regarding the bacteriostatic action of the furan group of compounds, prepared a number of furan compounds and screened them against various organisms. The nitro group was found to be essential in activating these furan compounds. The most active compounds were definitely bacteriostatic against at least five of the six test organisms which included both gram-positive and gram-negative bacteria. Cramer and Dodd[2] investigated the mode of action of the nitrofurans using *Staphylococcus aureus* as the test organism. One compound, 5-nitro-2-furaldehyde semicarbazone (furacin—brand of nitrofurazone N. N. R.), was found to have an unusual mode of bacteriostatic action. It showed marked activity during the lag phase of growth; prolonging the phase.

Furacin is a lemon-yellow, crystalline substance. It is stable at 15 pounds pressure for at least 15 minutes in the autoclave but decomposes above 227° C. It is slightly soluble in water (1gm in 4200cc), and is soluble in the high molecular weight, polyethylene glycols (1gm in 100cc). Light and certain metals discolor the furacin, but it still retains its antibacterial efficiency.

In 1945 Krantz and Evans[3] found the drug to have no toxic affect on blood pressure, respiration, or cardiac action, when administered to dogs in relatively large doses. In acute toxicity tests, the LD_{50} for rats was found to be 590mg per kilogram and for mice 380mg per kilogram. After the animal experiments, they ran several preliminary tests on man. One person took 100mg of the drug orally with no demonstrable symptoms. Several other persons took 100mg three times a day. Then the dose was increased to three or four grams daily. This dose was well tolerated in 80% of the test patients. However, 20% experienced nausea. Results of routine blood and urine tests were normal. This pharmacological study showed that relatively large doses are nontoxic to animals. Toxic doses in animals produced hyperexcitability of the central nervous system.

Dodd[4] (Jan., 1946) investigated the chemotherapeutic properties of furacin *in vitro* and *in vivo*. He found definite beneficial effects in the treatment of both bacterial and trypanosome infections in mice by oral, subcutaneous or intramuscular administration of the drug. He also noted that the only compounds effective *in vivo* were those nitrofurans closely related to the semicarbazone compounds.

Dodd confirmed Krantz and Evans findings that the toxic doses in rats and mice produced hyperirritability, tremors, convulsions, and respiratory failure. Histological studies showed no pathologic changes to account for the symptoms produced by oral administration, but severe toxic hepatitis and extensive degeneration of the renal tubules were found after massive subcutaneous doses. The *in vivo* studies indicate that furacin is effective orally in mice infected with *Staph. aureus, Streptococcus pyogenes* (hemolytic), *Salmonella schottmuelleri* and *S. aertrycke*. It was not effective against Pneumococcus. It was very effective in the treatment of *Trypanosoma equiperdum* infections, protecting 100% of the rats against a 100% fatal dose of organisms when 100mg per kilogram of the drug was given orally. Preliminary experiments indicated activity against *Treponema pallidum in vitro* and *in vivo* in infected rabbits. A recent report by Green and Mudd[5] indicates that when several gram-positive and gram-negative bacteria *(Staph. aureus, Escherichia coli, Proteus vulgaris, Streptococcus viridans, Staphylococcus albus,* and *Shigella dysenteriae)* are made resistant by repeated cultures in increasing concentrations of three other drugs; sulfathiazole, streptomycin and

penicillin, or obtained from patients being treated with these drugs, the organisms are still as susceptible to furacin as the original nonresistant organisms.

Dodd,[6] *et al.*, reported on the effects of several nitrofurans on the healing time of experimental wounds in rabbits. They concluded that two of these compounds are nonirritating, nontoxic and have no adverse effects on healing. One of these compounds is furacin (5-nitro-2-furaldehyde semicarbazone).

In August of 1946 Neter and Lambert[7] reported that furacin had proved effective in combating infections of wounds in rabbits. These wounds were made artificially and infected with beta hemolytic Streptococci. They concluded that further clinical work was definitely indicated.

Snyder,[8] *et al.*, in November, 1945, used the drug in treating chronically infected war wounds. The series was small: 10 patients. However, it was very well controlled. They noted that clinical improvement in all cases was directly correlated with a quantitative and qualitative reduction in the bacterial flora, especially of gram-positive organisms, as demonstrated by repeated cultures. They concluded that the compound is highly effective *in vivo*, in the control of surface infections.

McCollough[9] reported on his treatment of 94 chronically infected wounds. A total of 597 cultures were made and 97 of these were negative on the next examination after treatment was instituted. Twelve of the wounds had been indolent with no change in size or amount of drainage for an average of 50 days. They healed in an average of 21 days after furacin therapy was begun. There were four cases of sensitivity to the drug evidenced by a local, vesicular eruption and erythema. All of these cleared within one week after the drug was discontinued.

Downing,[10] *et al.*, reported in February, 1947, on the treatment of 212 patients. From the bacterial cultures it was evident that a large percentage of the infecting organisms, both gram-positive and gram-negative were controlled by the drug. In the summary, it was noted that the drug did not interfere with normal granulation and epithelization of the infected ulcers. There was no clinical evidence of toxicity due to absorption of the drug even when used in large amounts over prolonged periods.

In March of 1947, Shipley and Dodd[11] published the clinical and bacteriological results obtained in the treatment of 90 cases with superficial infections. Attention was called to the fact, that the use of this drug is no substitute for surgical intervention when indicated. In treating these cases, three facts were particularly noted: the effect on the base of the lesions, the amount of discharge, and the odor. In the majority the infection disappeared almost at once, leaving a clean, granulated base with no retardation of epithelization. The wound discharge decreased appreciably within 24 to 48 hours. The odor decreased within 25 hours and was closely correlated with the diminution of the bacterial flora.

All of these publications are in the field of human medicine. The only report which could be found on the use of this drug in veterinary medicine was a short preliminary report by Mires and Chadwick[12] regarding its use in treating mastitis. In October, 1946, furacin in its ointment-like base (furacin soluble dressing, Eaton) was first used by the author for the treatment of superficial infections of small animals. Later, in practice, a solution of the drug has been used with continuing good results. The base used has the consistency of an ointment but is completely soluble in water and wound secretions. It is composed of a mixture of higher molecular weight polyethylene glycols. This base contains no water. However, the solution contains 35% water, high molecular weight polyethylene glycols and a wetting agent. Both contain 0.2% furacin in solution.

The following chemical reports serve as illustrations of the excellent results I have obtained by using this new antibacterial agent.

Clinical Reports

Case 1.—A mongrel spitz bitch, three months of age, was injured by an automobile. The right femur was fractured just above the stifle joint; the hock joint had been ruptured and was draining; the entire limb was greatly swollen.

A temporary splint was applied, with a fenestra left to treat the joint which was debrided, irrigated and packed with sulfathiazole ointment. Two days later a permanent modified Thomas splint with a window was applied. Since purulent fluid was still discharging from the open hock joint, in spite of the topical sulfathiazole therapy, this drug was discontinued. Furacin soluble dressing was then packed into the joint and applied to the surrounding area in liberal amounts.

One day later, the discharge from the joint had decreased and become less purulent. Four interrupted, nylon sutures were then applied to approximate three-fourths of the skin over

the joint, leaving an opening for drainage. Two days later the discharge had ceased. The remaining skin orifice was scarified and closed with two sutures. Two weeks later all stitches were removed and the joint was found to be perfectly healed. This was extremely gratifying in view of the generally poor prognosis for open, infected joints.

Case 2.—A mongrel bitch, six months of age, had an infected, gangrenous area about 4 by 5 inches, over the posterior quarter of the left breast and the inner aspect of the left thigh. Her temperature was 100.2° F. and the general condition was fair. The owner stated that an ovario-hysterectomy had been performed on the animal recently. A tight bandage may have been the cause of the present condition.

All necrotic tissue which was sloughing, was removed by debridement, leaving a lesion about ⅜ inches deep. About two ounces of furacin soluble dressing was applied to a large gauze pad, which was then placed on the area. This pad was covered with a sheet of waxed paper which was held in place by bandage.

The next day, under aseptic conditions, the remainder of the loose gangrenous tissue was debrided. The appearance of the lesion was now remarkably good, especially since I had been quite skeptical of any success in this case. This debridement as needed and reapplication of furacin soluble dressing on gauze was repeated daily for eight days. During this time granulation tissue formed very satisfactorily in the wound. On the ninth day topical furacin therapy was discontinued, since no signs of infection remained. Mild surgical dusting powders were used from then on. On the twelfth day the dog was discharged with directions for home care.

Case 3.—A three-year-old, beagle bitch had been treated unsuccessfully by the owner for three or four days for dog bites. The temperature was 102° F., the pulse and respiration were normal and the appetite good. There were two distinct punctures on each side of the withers. There was also one bite wound on the left shoulder. After washing the wounds and the surrounding areas, the scabs were removed and about 6cc of purulent fluid was expelled from the wounds on the withers. The shoulder wound was already healing. By means of a probe it was learned that subcutaneous fistulous tracts connected both the punctures on the left side with the corresponding wounds on the right side. The shoulder wound was about one and a half inches deep into muscular tissue.

After flushing the fistulous tracts with chloramine-T solution, two strips of sterile gauze impregnated with furacin solution were inserted and pushed through the tracts. The ends of each drainage wick were tied together on the top of the withers. The single shoulder wound was packed with furacin soluble dressing. Because the owner did not desire to have the dog hospitalized, a body bandage was applied.

Two days later the dog was returned, the bandage removed and the wicks withdrawn. There was a small amount of a serous, nonpurulent discharge. The fistulous tracts appeared to be healing well and on the whole a vast amount of improvement was seen. The wounds were then packed with furacin soluble dressing without wicks and a body bandage was applied. Six days later, when the patient was seen again the bandage had been removed and the wounds were practically healed.

Case 4.—A male cat, seven months of age, showed signs of pain in the ears. The temperature was 103.6° F. There was a distinctly fetid odor from the ears, together with a purulent discharge. Following otoscopic examination, a diagnosis of chronic, suppurative otitis media was made.

The external auditory meatuses were cleansed with cotton swabs dipped in ether, removing as much débris as possible. Four drops of furacin solution were instilled into each ear.

This above procedure was repeated twice daily for the next five days. The discharge steadily diminished in amount and became less purulent until by the sixth and seventh day, little discharge was observed. The dosage of furacin solution was then diminished to two drops once daily in each ear for the next several days and then to one drop in each ear once a day. Therapy was finally discontinued on the eleventh day when the patient was discharged as cured.

Case 5.—A one-year-old, castrated cat had seven infected bite wounds on the back. They had been inadequately treated by the owner. The animal refused to eat, had a temperature of 105.2° F. and was showing definite signs of systemic infection.

The entire back was clipped closely to provide drainage for the large amount of purulent fluid that had been collecting subcutaneously. Each wound was thoroughly probed to make certain that there was adequate drainage. Furacin soluble dressing was packed into

each wound as deeply as possible. Because of the difficulty in keeping bandages on a cat, none was applied, but the areas were kept well covered with the dressing at all times. Sulfathiazole was administered orally.

Five hours later the cat's temperature had dropped to 103° F. and the next morning to 102° F. At this time the wounds looked much better and the discharge was more serous and less purulent. However, soluble dressing was kept in constant contact with the wounds for seven days. On the eighth day, little evidence remained of the original, badly infected wounds. The sulfathiazole had been discontinued as soon as the temperature returned to normal.

On the eighth day the patient was discharged and the owner instructed to apply a mild dusting powder on the wounds. I consider the results in this case to have been excellent.

Case 6.—A one-year-old, German shepherd male had gangrenous eczema of the crest, withers and back. The temperature was 104° F., the appetite fair and the general condition was good.

The lesions were cleansed with sterile cotton saturated with 70% alcohol. Furacin soluble dressing was then mixed with a small amount of nupercainal ointment to attain anesthesia of this painful lesion. This mixture was applied in a thick layer on a large gauze pad which was bandaged into place. Sulfathiazole, 1.5gm was administered orally, and the owner permitted to take the animal home.

Three days later the dog's temperature was 102.4° F. and the lesion was much improved in appearance. The small amount of remaining gangrenous tissue was debrided. Because there were no further signs of infection, furacin therapy was discontinued and a mild dusting powder was used thereafter until healing was complete.

Case 7.—A male, cocker spaniel, three months of age, showed a severely infected tail stump. The animal was in considerable pain as evidenced by his continual whining. On examination it was obvious that a crudely amateurish amputation of the tail was responsible for the gangrenous condition. The temperature was 103° F. and there was anorexia.

The stump was bathed with chloramine-T solution and easily removable necrotic tissue was debrided. A mixture of two-thirds furacin soluble dressing and one-third nupercainal ointment was applied to a gauze pad which was then taped securely over the infected stump. The owner was allowed to take the dog home with a jar of the above ointment for home dressings.

Two days later the owner reported that the wound was very much improved; there being no further purulent discharge, and the dog was behaving normally. On the seventh day the animal was returned for examination. The results were brilliant. Granulation tissue had about filled in the wound and healing was practically complete.

Case 8.—A one-year-old, female cat exhibited a gash 1.5 inches long and about 0.5 inch deep on the left hip just above the joint. The wound was slightly infected and the temperature was 103.8° F.

The lesion was debrided and packed with furacin soluble dressing. At the owner's request, 300,000 units of penicillin in oil was injected intramuscularly.

The following day, the temperature was normal and when the dressing was removed it was obvious the wound was in excellent condition, not nearly this much improvement had been expected. The entire area was clean and showed signs of rapid regeneration. On the third day the cat was discharged with a bottle of furacin solution for further local application.

Case 9.—A two-year-old, castrated cat had been unsuccessfully treated by its owner for an infection on the left flank, resulting from a bite. There was a gangrenous area measuring approximately 5x7cm in extent and the temperature was 103° F.

A loose necrotic layer of tissue was easily removed exposing a large mass of yellowish green material of the consistency of custard. The wound was irrigated with chloramine-T solution and a large sterile gauze pad covered with a thick layer of furacin soluble dressing was placed over the infected area. Sulfathiazole, 1gm, was given orally.

The following day the temperature had dropped to 101° F. The cat was a great deal more active and its appetite had improved. The wound was now completely debrided and re-bandaged after applying more of the soluble dressing. On the third day after admission the cat was taken home by the owner who was given directions to apply furacin solution as a wet dressing. She later reported that the animal was again active with little remaining evidence of the past infection.

Case 10.—A one-year-old, castrated cat suf-

fered a complete fracture of the symphysis of the mandible and a compound fracture of the right vertical ramus below the condyle of the mandible. There was a fetid odor and a purulent discharge.

Although the prognosis was not good, at the owners urgent request the jaw was wired together. A pocket, which had been formed when the lower lip was detached from the mandible, was packed with furacin soluble dressing.

Topical application of both furacin soluble dressing and furacin solution was repeated three times daily for three days. On the fourth day the infection was about cleared and the odor had disappeared. The cat is still under observation and furacin being applied after feedings to prevent reinfection of the healing wound.

Case 11.—A four-year-old, dachshund bitch had been treated by the owner for a small "tumor-like body," about one inch in diameter. On examination I saw evidences of a foreign body and after lancing and probing a fistulous tract, a splinter of wood about 1½ x ¼ inches in size was discovered and removed.

The wound was irrigated with chloramine-T solution and then swabbed with a cotton applicator soaked in furacin solution. A gauze pad covered with furacin soluble dressing was applied and bandaged on.

The next day debridement was performed and the wound was closed with two nylon sutures after which furacin soluble dressing on gauze was again applied. Two days later the patient was discharged and the owner was given a jar of furacin soluble dressing for further application at home. Two days later the owner notified me that the wound was progressing well and that he was removing the stitches.

Case 12.—A mongrel scottie bitch, 18 months of age, showed severe inflammation of the right eye which was completely closed by the swollen lids. Following topical application of butyn solution, I was able to examine the eye. The lids were denuded of hair, swollen, raw and infected. When they were forcibly separated, a thick purulent exudate escaped. The eyeball was inflamed and exhibited an extensive subconjunctival hemorrhage. The temperature was normal and appetite fair, indicating that the infection was still localized.

The external lids were bathed with alcohol and metaphen solution and the conjunctiva was treated with 1% mercuric oxide opthalmic ointment and 10% argyrol. This treatment was continued twice daily for three days without definite evidence of improvement. The purulent discharge was still much in evidence and the inflammation had not diminished.

On the fourth day a thick layer of furacin soluble dressing was applied on a gauze pad which was fixed over the eye with a head bandage. The following day there was a slight improvement. This furacin therapy without other treatment was continued for four more days, by which time the lids had regained their normal appearance and all signs of the conjunctivitis had disappeared. The dog also ceased pawing the area at this time. A day or two later the skin on the lids appeared quite normal. The animal was discharged and later the owner informed me that hair was beginning to cover the lids and little evidence of the severe infection remained.

Case 13.—A one-year-old, Labrador bitch was suffering from moist eczema with patches of gangrene in an area measuring about 5 x 2 inches at the base of tail.

The area was cleansed with alcohol and ether. Because the dog was in great discomfort, nupercainal ointment was mixed with furacin soluble dressing and applied.

Within twelve hours the area appeared much better and the animal was more at ease. Furacin soluble dressing was applied for the next several days both with and without bandages. On the fourth day of treatment the area had cleared sufficiently to allow the use of drying agents and surgical dusting powders.

Case 14.—A male, mongrel bull terrier, four months of age, showed the typical symptoms of a neglected case of the respiratory type of distemper. The animal's temperature was 103.2° F. There was a mucopurulent discharge from both the eyes and nostrils as well as other typical symptoms of the disease.

The prognosis was unfavorable. We applied our usual procedure of injections of serum and other medication and for the first time in this condition we used furacin solution, applying two or three drops t.i.d. in both the eyes and nostrils. The owner took the dog home with directions for continued application of furacin solution.

In 24 hours the purulent discharge from the eyes and nose had disappeared and a serous drainage vanished completely about three days later. These results were most encouraging to the owner.

Case 15.—A male cat, 18 months of age, had a tumor about one-quarter inch high and one inch in diameter on the anterior surface, just above the elbow of the left fore limb. It

was doughy to the touch and felt as if it contained fluid. The animal's temperature was 104.2° F. He was quite listless and had a poor appetite.

The area over the tumor was shaved and disinfected. A 20-gauge, hypodermic needle was inserted into the center of the tumor and about 2cc of a thick, purulent fluid was aspirated. A three-fourths inch incision was made. Three cubic centimeters more of purulent fluid was expelled as well as about 2cc of a soft, gelatinous, adipose tissue. A four-inch, gauze wick was then soaked in furacin solution and gently packed into the wound. A gauze dressing covered with a layer of furacin soluble dressing was applied and bandaged over the leg. The owner took the patient home with directions for oral administration of sulfathiazole and sodium bicarbonate.

The next day the cat's temperature had decreased to 103.6° F. but the animal was still not normal. The gauze wick was removed and about 3cc of seropurulent fluid was expelled. The wound was thoroughly cleaned. Another wick soaked in furacin solution was applied and the leg was bandaged. Penicillin 300,000 units in oil was then administered intramuscularly. The following day the wound was much better and the temperature had dropped to 101.8° F. The animal's condition appeared normal. The latest reports indicate that the animal has recovered completely.

Case 16.—A male, mongrel terrier, four months of age, was run over by an automobile. There was a spiral fracture of the right femur and severe lacerations of the left leg especially above the hock.

The fracture was reduced and the wound irrigated with chloramine-T solution and sutured with gut. The next day it was obvious that the lacerations had become infected. A few sutures were removed to provide drainage and furacin soluble dressing was applied.

On the third day, the second day of furacin therapy, the wounds were very much improved with but little drainage. A day later the infections had cleared completely, the wounds showed signs of healing and newly formed granulation tissue was much in evidence. The dog was finally discharged with complete healing of the lacerations and the fracture.

In a few of our cases we noted there seemed to be an excessive amount of granulation tissue formed while using furacin. For that reason it has been our practice, once an area is cleared of infection, to discontinue the use of furacin and substitute milder emollients or dusting powders. This observation, in a few isolated cases, needs further clinical confirmation.

There were no signs of local irritation or sensitization following the use of furacin.

Summary

A review of the published literature regarding a new antibacterial agent 5-nitro-2-furaldehyde semicarbazone (furacin) is given. Laboratory and clinical evidence indicate that this new antibacterial agent should be useful in the practice of veterinary medicine. A number of reports of superficial infections in dogs and cats, which illustrate the beneficial results with this new antibacterial agent, are given.

Conclusion

A new antibacterial agent 5-nitro-2-furaldehyde semicarbazone is a useful addition to the armamentarium of the practicing veterinarian.

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Clinical Reports

Disease Outbreak in Foxes Due to Insanitary Environment

At the request of the Provincial Government of one of the Maritime Provinces of Canada, an investigation of a disease outbreak on a fox ranch was made March 27, 1947.

History.—The first fox carcass from this ranch was submitted to a local laboratory on January 29, 1947. February 5th another specimen was submitted to the laboratory from a nearby ranch. Smears made from the epithelium of the bladder and trachea were negative for distemper inclusion bodies. However, a culture of Salmonella organism was readily isolated from these carcasses. Approximately 30 fox carcasses were examined from this second ranch, and Salmonella or paratyphoid organisms were found. All smears made from these carcasses too were negative for distemper inclusion bodies. As time elapsed, the virulence of the Salmonella organism seemed to increase in pathogenicity for laboratory animals.

February 17, because of the insistence of the owner of the second ranch, and contrary to the recommendations of the provincial veterinarians, all foxes on the ranch were vaccinated with fox distemper vaccine (Green Method). February 22, the first case of distemper was observed by the attending veterinarian. This was five days after the first injection. Losses were increasing daily at this point and then seemed to taper off.

A specimen submitted to the Provincial Veterinarian of another Province had been diagnosed as distemper, prior to the time these animals were given distemper vaccine.

March 29, 1947, an inspection on the second ranch was made together with three local veterinarians. Findings were as follows:

1. The site was on clay soil.

2. This is one of the most insanitary fox ranches I have seen. Horsebones, smelt and skate fish in varying quantities and degrees of decomposition were scattered about in nearly every pen. Old mixed feed, fox checkers, and pellets were mixed in with this mass.

3. Pelted carcasses were lying at random throughout the yard.

4. Fox ranching was a side issue with the rancher who had other means of livelihood.

5. Three sick foxes were observed but the rest appeared to be normal.

6. The pens and equipment were in a run-down condition.

7. Water from melted snow was standing in pools in many of the pens and the animals were walking around in this muck.

8. According to the report of the Provincial Veterinarian, the foxes had been shut out of the kennels for mating and were exposed to much inclement weather. Certainly foxes have no desire to mate under such conditions of exposure and discomfort.

9. The feed mixing room was not in the proper state of cleanliness.

A fox carcass from each of these ranches was taken and examined at the Provincial Laboratory. The report follows:

Ranch No. 1

I. Post-mortem examination:
   1. Few lesions of disease were present.

II. Microscopic examination:
   1. Negative for distemper inclusion bodies.
   2. Negative for encephalitis inclusion bodies.
   3. Fecal examination negative.
   4. Cultures were positive for Staphylococcus.

III. Diagnosis:
   1. Generalized infection possibly from contaminated food.

Ranch No. 2

I. Post-mortem examination:
   1. Pneumonia.
   2. Chronic nephritis.
   3. Hemorrhagic gastroenteritis.
   4. Inflammation of the mesenteric lymph nodes.
   5. Parasitism:
      a. *Anklylostoma caninum* (hookworm) heavy infestation.
      b. *Eucolies aerophilous* (lungworm) moderate infestation.
      c. *Isospora bigemina* (coccidia) heavy infestation.

II. Microscopic examination:
   1. Positive for distemper inclusion bodies in smears made from the epithelium of the trachea and bladder.
   2. Pure culture of Salmonella.
   3. Negative for encephalitis inclusion bodies.

III. Diagnosis:
   1. Paratyphoid infection complicated by parasitism.
   2. Secondary distemper from the vaccination.

All of the smears made from the various carcasses before my arrival were checked and the diagnosis was found to be correct. The slide examined in the adjoining Province was

found to be of no value for examination for distemper inclusion bodies. The wrong stain had been used and it was overstained to such an extent that it was impossible to make a diagnosis from it.

General Observations

1. This rancher is well-known throughout the fur industry as a reputable breeder of mutation foxes. It is surprising that this type of animal can be raised under such insanitary conditions. This man has been very fortunate in not having greater losses during the 25 years he has been in fox ranching.

2. Clay soil favors the increase of parasites as the parasite ova do not become buried in the ground, but remain on the surface constantly available for feed contamination. Any heavily parasitized animal is a poor vaccination risk. It has been observed in the past that foxes suffering from parasitism, malnutrition, or even infections may succumb when fox distemperoid vaccine is injected into them. Supporting these findings is the fact that losses began five days after the animals received the distemper vaccine.

3. Another factor that has been given little attention is the fact that many mutation foxes are closely inbred. One strain of foxes on this ranch is so inbred that it is genetically unsound. For instance, it can be predicted that in one combination of mating one puppy out of the resulting litter will die shortly after birth. Those that reach maturity will oftentimes be deaf, have a typical twitching of the head, and show extreme nervousness when a stranger is observed or different vibrations of the pen are felt. Theoretically, this type of animal is also a poor vaccination risk; data are insufficient to give accurate information relative to its capability of being immunized.

4. The owner appeared to entertain a certain degree of antagonism against the provincial veterinarians. These gentlemen had cooperated to the fullest extent, made correct diagnoses, and made proper recommendations relative to the sanitary measures to be followed. These facts were entirely ignored by the owner and, since he had raised foxes for years under these insanitary conditions, he could not believe that there was anything existing on his ranch that could cause these losses.

At the time this investigation was made a more or less "stalemate" existed between the owner and the veterinarians. It is believed that this was due to ignorance and lack of cooperation on the part of the owner who did not want to believe the diagnosis made by the veterinarians. Supporting this conclusion is the fact that the owner, contrary to the recommendations of the provincial veterinarians, insisted that his foxes be immunized against distemper.

Conclusions

Losses on Ranch No. 2 as well as those on adjacent ranches following the same existing methods of fox husbandry will continue until—

1. The owner is willing to cooperate with the provincial veterinarians and institute the sanitary measures recommended by them.

2. The numerous species of parasites existing on this ranch at present are eliminated or brought under control.

3. A better understanding exists between the owner and the veterinarians. The owner is not technically trained and, despite his long experience, should allow those who are, to make the diagnoses and recommendations. The provincial veterinarians are very capable men and originally made an accurate diagnosis in this case—Salmonella infection.

Lack of good judgment on the owner's part and the numerous complicating factors involved in this case accounts for the losses suffered to date.

T. T. CHADDOCK, M.S., D.V.M.
Grafton, Wis.

Book Reviews

Index of Diagnosis, Clinical and Radiological, for the Canine and Feline Surgeon, by *Hamilton Kirk,* M.R.C.V.S. official veterinarian to the Clayton Greyhound Stadium. Third edition; 600 pages, 321 illustrations including 65 radiographs. Published by Williams and Wilkins Company, Baltimore, 1947. Price $10.00.

Both preceding editions of "Kirk's Diagnosis" were reviewed in these pages in some detail (*Vet. Med.*, July, 1939, p. 458 and September, 1945, p. 325). This edition preserves the same arrangement (encyclopedic or alphabetical) and is distinctly improved by omission of the miscellaneous excursions into the field of therapy, which were included in the earlier editions. The space they occupied and more (this edition is 13 pages larger than the second edition) is used for 19 additional illustrations and treatises on the diagnosis of Schlatter's disease, pneumothorax, epulis, pathological fractures, osteogenesis imperfecta, kyphosis, lordosis, pigmentation and growth of hair, hernia, hydrops amnii, dental decay, extrauterine pregnancy, sunstroke, heat stroke, and bone tumors which were not included in earlier editions. Articles dealing with blood examination, avitaminosis, encephalitis, hysteria, feline infectious enteritis, canine distemper, esophageal dilatation, spinal diseases, sterility and various others have been revised to a greater or less extent. It is noted that the author rejects Mellanby's theory that agenized flour in the ration is a cause of hysteria or fright disease in dogs. However, he accepts Mellanby's diagnosis of the convulsions in his experimental dogs as being hysteria, which is even more doubtful than his (Mellanby's) etiology.

Previous editions of this work have proved extremely popular with small animal practitioners in the United States and Canada. The American allotment of the second edition was all sold within two months of the date it was placed on the market. This edition should prove even more acceptable.

Any book reviewed in these pages, or any other book if available, may be obtained by remitting the published price to VETERINARY MEDICINE, 7632 S. Crandon Ave., Chicago 49. Bulletins and Circulars should be requested direct from the address given in the notice. Generally they are supplied free unless a price is stated.

Illustrated Laboratory Outline of Veterinary Entomology and Helminthology, by *J. H. Whitlock,* Assistant Professor of Parasitology, New York State Veterinary College at Cornell University. Spiral wire binding, offset printing, 87 pages. Published by Burgess Publishing Co., Minneapolis, Minn., 1947. Price $3.00.

This is Part I of a laboratory guide to veterinary parasitology in two parts. In the author's words it is designed "to aid the student to use the basic principles of taxonomy to identify the common parasites of domestic animals. Rather than have the student spend much valuable laboratory time drawing what he sees, a series of illustrations is provided for such study and labeling as the instructor and student desire."

This work comprises 26 pages of text matter giving classification, morphological characteristics, and some life history of the commoner parasites of animals, including both medical entomology and helminthology.

The remainder of the guide consists of 31 plates containing six to 12 excellent drawings each and 31 pages of legends.

Some may question, that the student can "spend much valuable laboratory time" more profitably than in "drawing what he sees" and thus perhaps seeing a great deal more and fixing it more firmly in mind than otherwise. There can be no question, however, of the welcome aid these drawings will be to the reader whose knowledge of the subject has retreated to the dim recesses of the encephalon.

Some misspelled words and other typographical errors and occasional words wrongly used are expected in first editions, but this one has rather more than its share. However, in this instance, at least, they do not lessen the usefulness of the work. It is the reviewer's opinion that many practitioners as well as students will find it useful in identifying parasites of animals.

Bulletins, Circulars, Reports, etc.

Length of Gestation Period in Brown Swiss.—From a review of the literature and records of 148 gestation periods in the college herd the authors (Weaver, Wettstein and Horwood) conclude that the gestation period in the Brown Swiss breed (291 to 293 days) is 10 days longer than the average for all dairy breeds. Article 30-25 (November, 1947) Michigan Agr. Exp. Sta., East Lansing.

Mastitis Control in the Pen-Type Dairy Barn.—The author (Bryan) experiences no difficulty in bringing mastitis outbreaks under control in three herds. Kept in "loafing barns" between milkings and maintaining them in satisfactory condition. Article 30-18 (November, 1947), Michigan Agr. Exp. Sta., East Lansing.